ANOTRONIC™

PC-Based EDM System

Operation Manual

ANOTRONIC LTD.™

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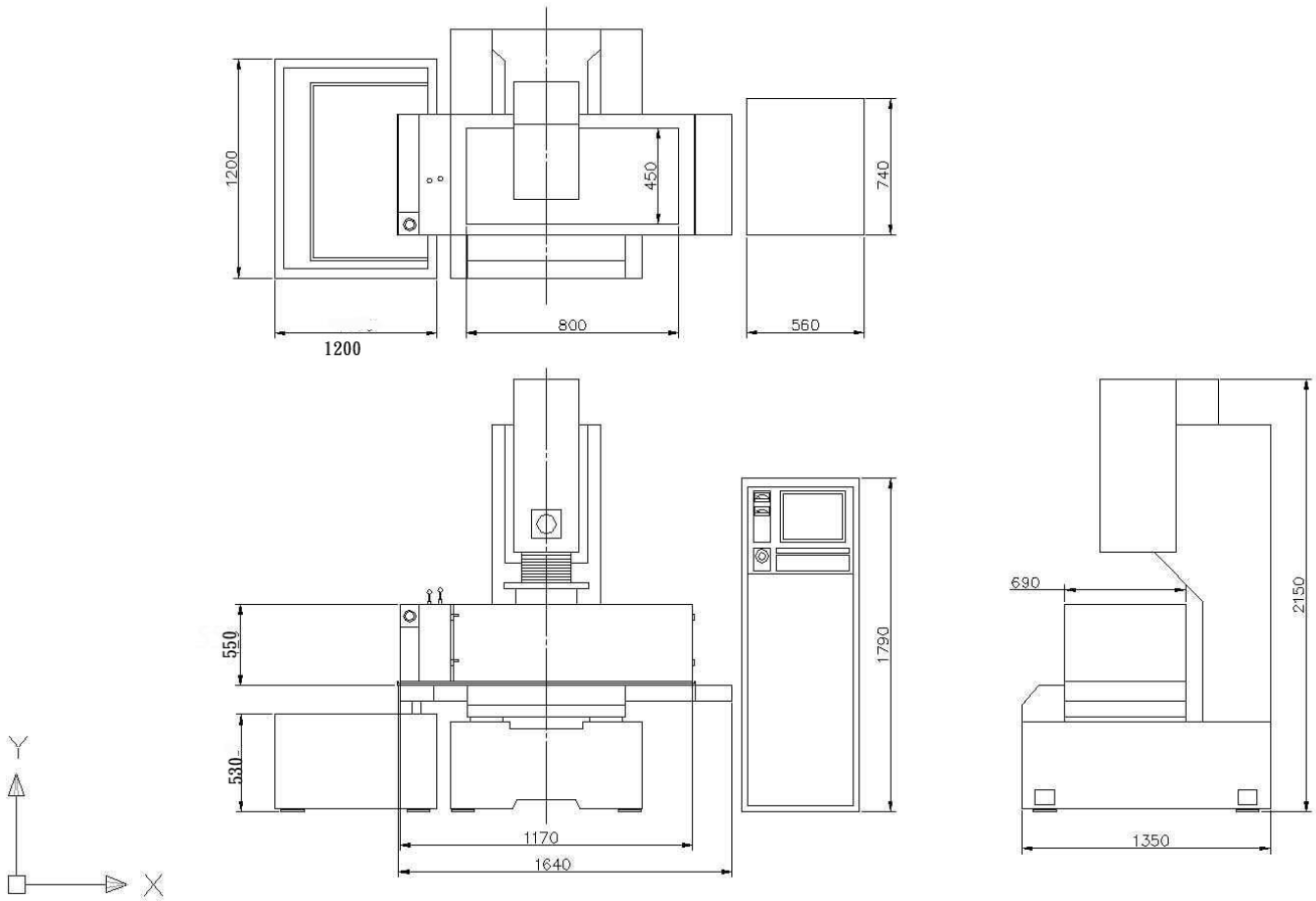
PC- ased EDM System

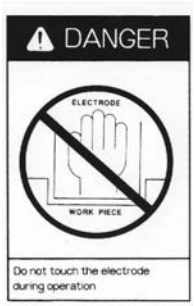
Installation Information

1. Diagram

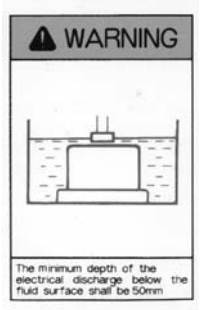

1200
450
740
1200
800
560
550
530
1790
690
2150
1170
1640
1350
Y
X

2. Warning Sign Interpretation ：

DANGE
ire potential hazard keep flames away



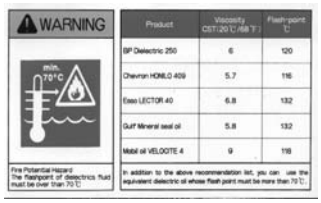
DANGE
Do not touch the electrode during operation



WA NING
The minimum depth of the electrical discharge below the fluid surface shall be 50mm

WA NING
Health potential hazard
umes must be removed by extraction
e uipment

DANGE
Hazardous voltage
Turn off power before servicing



WA NING

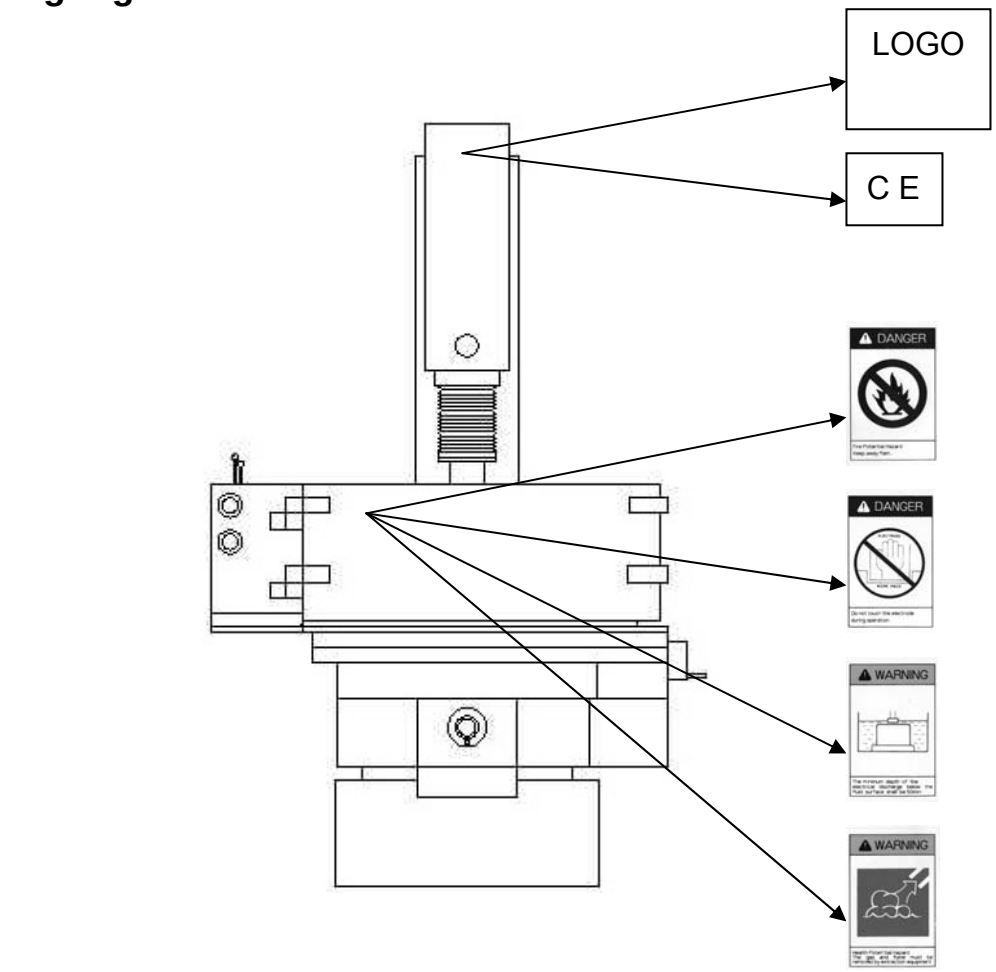
ire potential hazard

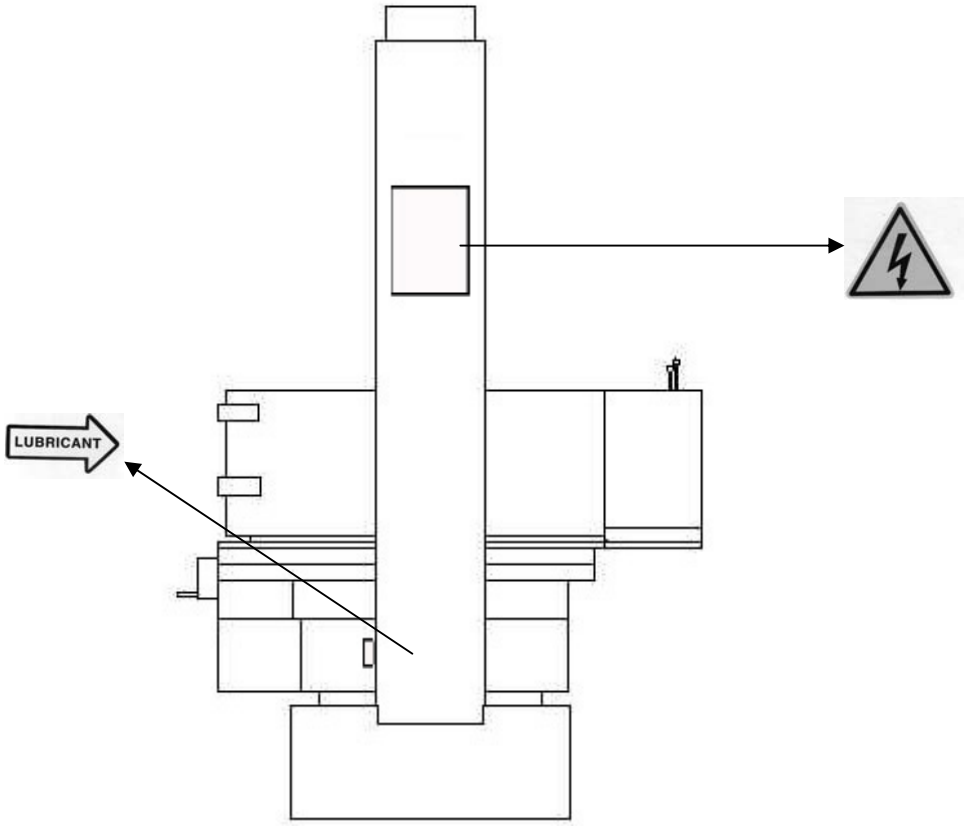
The flashpoint of dielectric fluid must be over 70 C

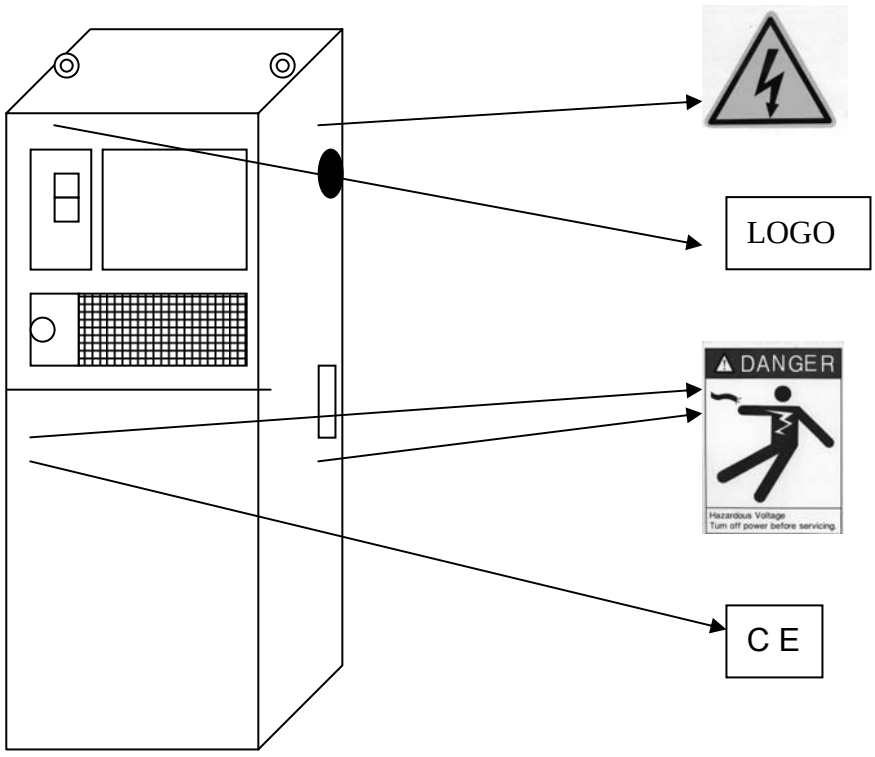
Only to be opened by a technician to avoid any danger

Lubricant

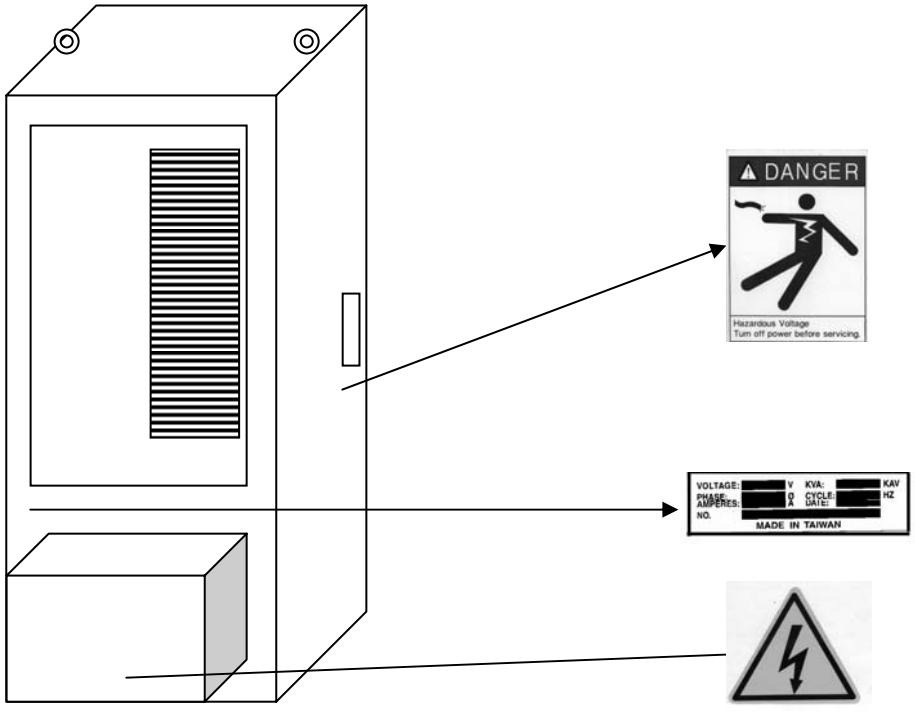
3. Warning Sign Position：






LOGO
DANGER
Hazardous Voltage
Turn off power before servicing.
C E

ront


DANGER
Hazardous Voltage
Turn off power before servicing.
VOLTAGE: V KVA: KAV
PHASE: Ø CYCLE: HZ
AMPERES: A DATE:
NO.
MADE IN TAIWAN

ack

4. Machine Specification：

Machine Specification

ITEM＼Model No.	V-35	nit
Working Table	700x350	mm
, ,Z Travel	400x300x200 350	mm
Z-axis Strike Dimension	200- 50	mm
Max. Electrode Weight	0	kg
Max. Workpiece Weight	700	kg
Working Tank	1070x5 0x370	mm
Machine Weight	1400	kg
Machine Outside Dim.	1 00x1400x2300	mm

Standard Accessories	Optional Accessories
Paper ilter	Auto ire Extinguisher
Electrode Holder	Dielectric Cooler
lushing Nozzles	Permanent Magnetic Table
Drill Chuck	System 3 Tooling
Clamping Kits	
Tool ox	
Working Lamp	

5. Packing, Transportation, Wooden case Disassembling & Lifting：

5.1 The E.D.M. machine is packed in a standard export wooden case, it must be handled carefully without dropping or tipping the machine. Care must be taken during transportation.

5.2 Detailed Checks on the unloaded Wooden Case

Please first check the outside of the wooden case as soon as you receive it. If you find any damage or have any ueries, notify us or our agents immediately before you unpack the wooden case.

＊Please do not place the packed machine outdoors without suitable protection to prevent accidental damage or the absorption of moisture

5.3 Wooden Case Disassembling Procedures（Shown as Pic. 1）

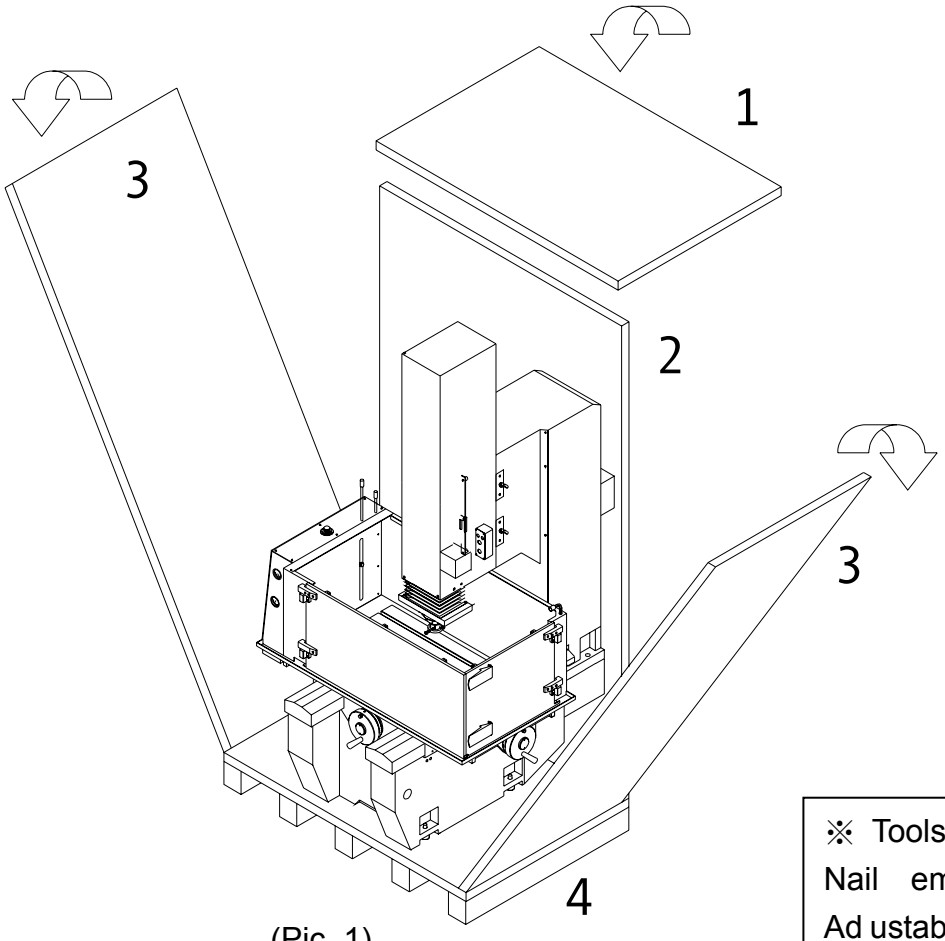
Please read the following procedure and see the figure shown below：

（1） emove the upper cover first。

（2） emove the side covers of front & rear machine part。

（3） emove the other two side covers。

（4） emove the locking bolts on the base of the case.



(Pic. 1)

※ Tools needed：
Nail emover、Hammer、
Ad ustable Wrench、Gloves

5.4 Load & nload

(1) POWE S PPL NIT

Transportation recommendation (power supply unit only).

sing a hoisting belt to thread through two rings on the top of power supply unit, (See Pic.2)

Weight：150 Kgs

(Pic. 2)

※ E uipment for Loading：
Crane or Lifter with loading capacity of 200KG or above 、3M Steel Wire (With Hooks)

(2) ecommended Loading methods for complete Machine：

sing Nylon elts (See Pic.3)

Procedures

（1）Move the tank to the end of -Axis。

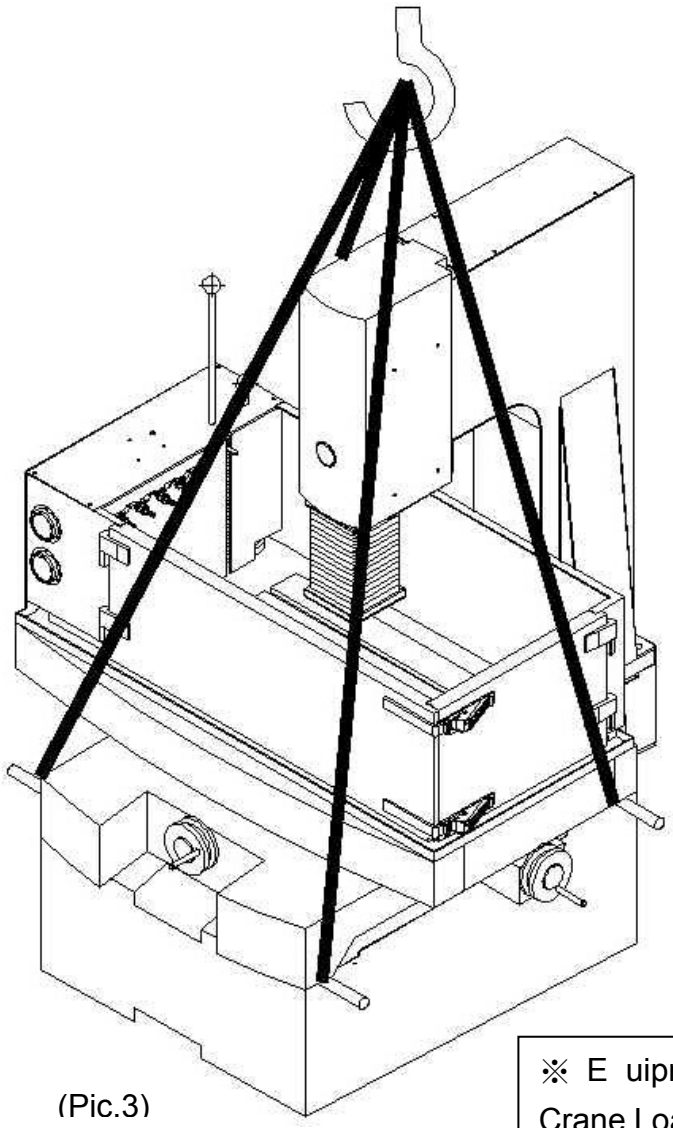
（2）See the Pic.3, Nylon belts hang on steel rings on machine body and hooked on the crane, Machine must be well balanced & stable

（3）Avoid & Protect the elts touching the surface paint of machine body 。

（4）Lift up & Move to correct site。

□Caution for all the movements，Keep the balance of machine ，Avoid Any Impact 。

Weight：1500 Kgs



(Pic.3)

※ E uipment for Moving：
Crane Loading capacity of 1700Kg above 、Steel Wire(5M)2

(3) Moving method by ork Lift Truck (See Pic.4)

Procedures

（1）Move the tank to the end of -Axis.

（2）Ad ust the forks of fork lift truck to a suitable width.

（3）Drive the fork lift truck in the centre direction of machine body, the forks must be longer than the bottom of the machine body.

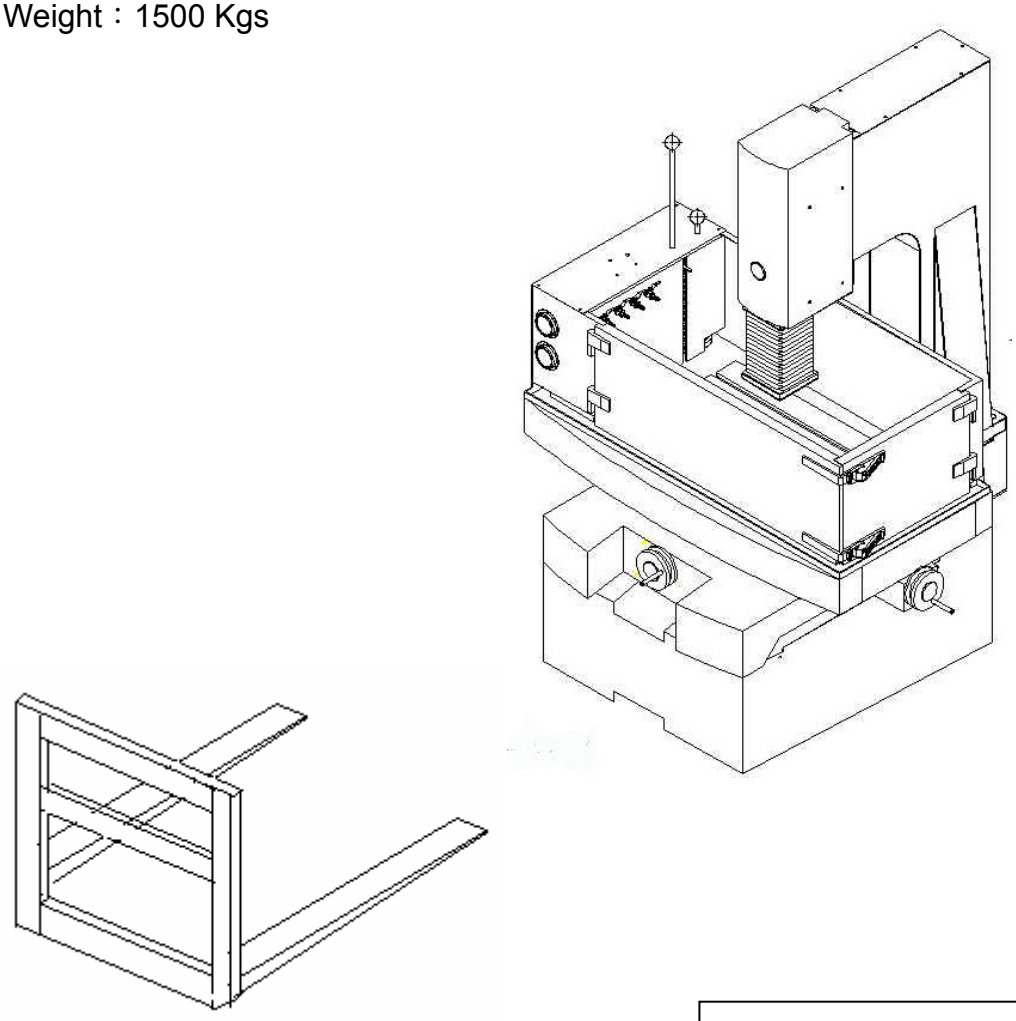
（4）Protect the surface paint of machine body.

（5）Lift the machine up to the suitable height. Caution for the stability & balance of machine body

（ ）Move to the installed site。

 or all the moving procedures，The balance of machine body must be kept and avoid any impacts。

Weight：1500 Kgs

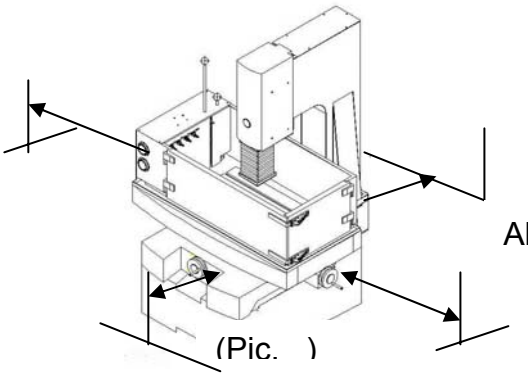


(Pic.4)

※ E uipments for movement：
ork Lift Truck with loading capacity of 1700KG above

6. Procedure of installation：

.1 Site the machine in its desired position. A space of 1M must be maintained all around the machine for operator's inspection & installation. Make certain that machine is well seated, avoiding any movements or unbalancing。(See Pic.)

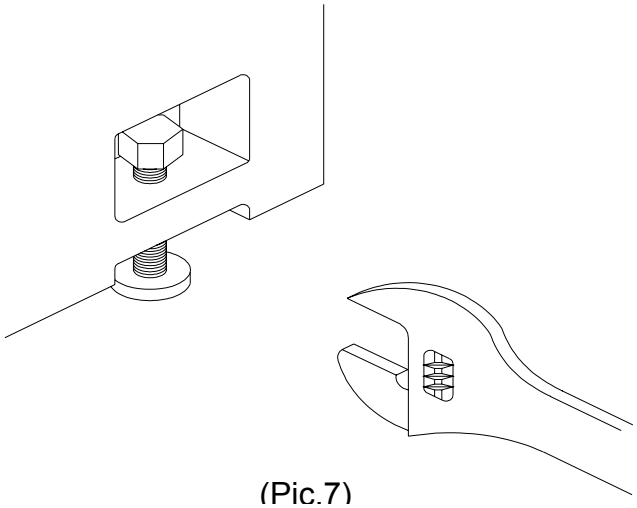


All clear space of 1M

(Pic.)

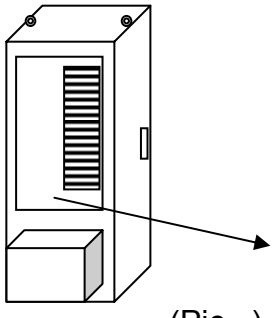
.2 Assemble & fix with bolts all the outer shell covers to the machine.

.3 Place a spirit level on the work table then ad ust the bolts on the machine base to achieve perfect level. 。(See Pic.7)



(Pic.7)

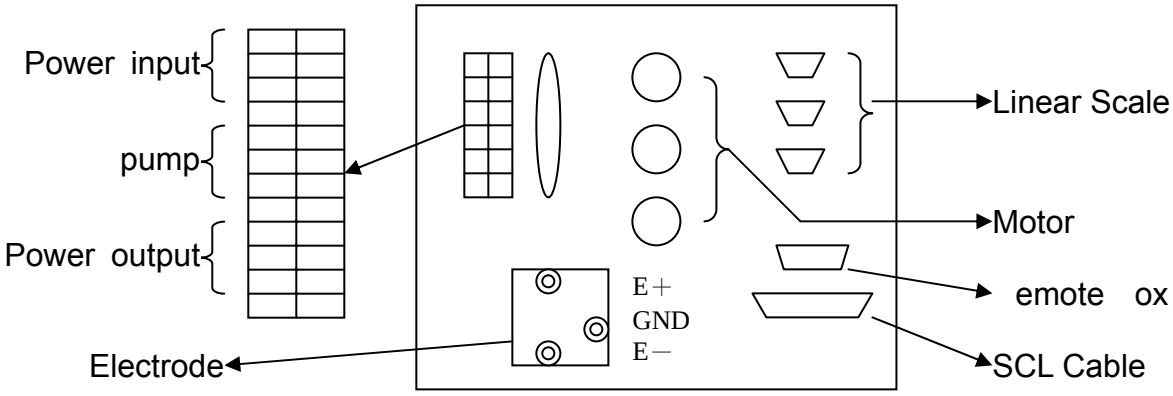
.4 Place the Power Supply nit to the right side of machine body. rom the Electrical box on the rear of Power Supply nit, remove the remote control box, key for door of Power Supply nit & Power Supply Specification. (See Pic.)



emove the cover and take above mentioned items

(Pic.)

.5 Connect all the signal cables on the machine to the Power Supply nit according the drawing on the rear cover of the electrical box Linear Scale Control Cable (D type Pin)、Motor Control cable (Metal Connector), SCL signal control Cable(D Type 25Pin)、 mm Electrode wire, Power cable for pump motor.. (See Pic.)。



(Pic.)

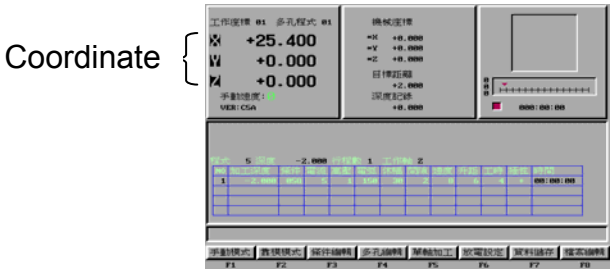
. Connect specified Power Supply to the electrical box.
emove the filter tray on the left side and pour the dielectric oil into the tank 。.

.7 Turn on the Electrical Supply (irst, confirm all the cables and wires are correctly connected)。

. Switch on the main power on the Power Supply nit, start operating.

7. Operation & Adjustment：

7.1 Confirm the moving value & direction of linear scale is correct 。Turn the main power switch on. Press 1. un the C T monitor only. DO NOT press the Power-On- utton，Turn the motor manually. Check the moving value & direction of the coordinates. (To finish the test, eset the main power on the power supply unit.) (Pic.10)

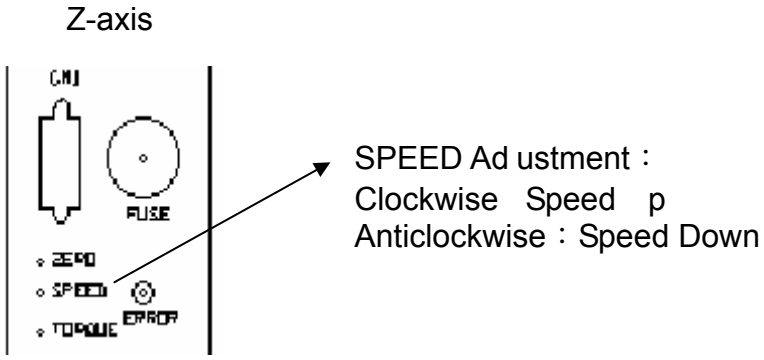


(Pic. 10)

7.2 Turn the power ON，Caution be ready to press O to avoid sudden axis running 。efore press ON, move the , ,Z axis to the centre of Linear scale to prevent the sudden axis running causing machine or other e uipments damaged. If sudden axis running happens, check the motor TG & the power supply of the axis is correctly connected.

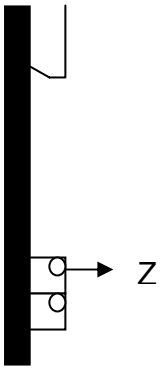
7.3 sing the remote control box to move Z axis, check the direction of moving correct or not. Check the limit sensors of Z axes and emergency stop button.

7.4 se the remote control box to move the axis, check the speeding stability of the axis & the overloading of motor. When overloading occurs during axis moving and causes electricity turn off, ad ust the SPEED knobs on the driver (See Pic.11)



(Pic.12) D I E is in the mid. ight of Power

7.5 When machine stands still, check the coordinates of all axes stay still. If the coordinate value umps consistently, ad ust the knobs on the PMC board to make the coordinate still. (See Pic.12) (or Z-axis, ad ust the first knob)

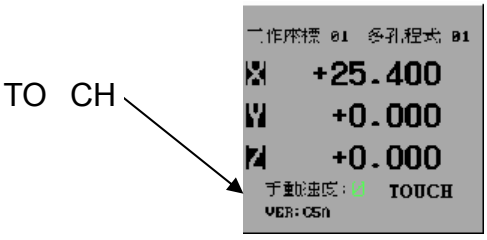


(Pic.12)

7.6 un the Home search procedure. (efer to the operational manual for procedure.)。

7.7 inishing the Home search, the electrode can be fitted to the machine for Short testing. Electrode Short Protection se a conductive material to touch the electrode & workpiece. When a long beep sounds and the signal of TO CH shows on the monitor, the function of Electrode Short Protection is O.K. (See Pic.13)

Test finished.



(Pic.13)

8. Procedures of machine abandoning：

When the machine needs to be eliminated and demolished, certain basic rules must be observed to protect the environment and public health. Please obey local safety regulation for EDM.. etc,.

All machine components must be divided according to category as follows：

All sheathes, flexible hosing and plastic or non metal components.

Electrical components are such as switches, lamp etc.

Insulation materials：

-- ock wool

-- lexible rubber strips

Metals and dielectric fluid：

-- errous metals

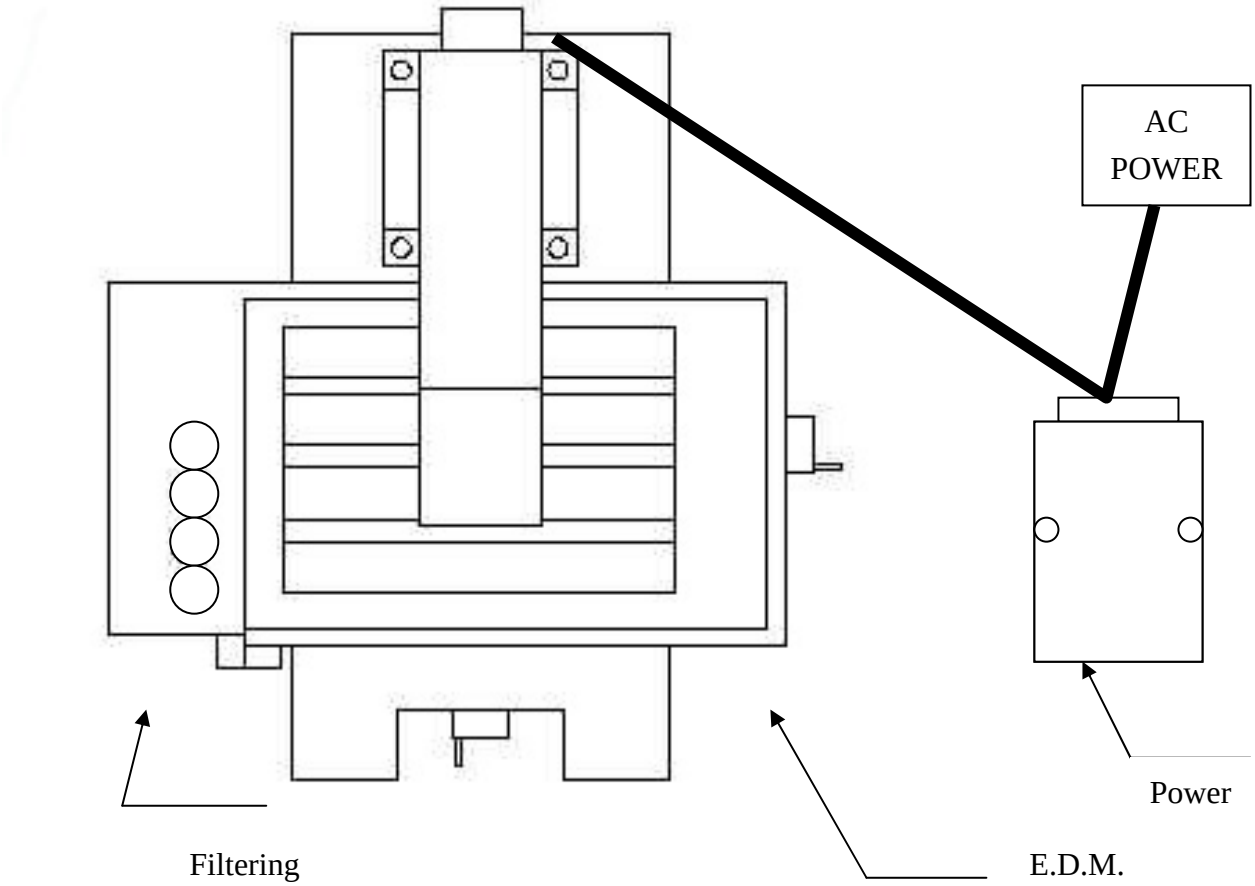
-- Copper

-- ronze and brass

-- arious

In this way all materials can be eliminated correctly, recycled, or melted down for re-use or disposed of so that they do not harm the environment.

9. Operator Position：



10. Safety Instructions：

10.1 This machine should only be operated by properly trained persons.

10.2 The operator must read, understand and follow all instructions and warnings.

10.3 Do not remove the machine signs, CE marking, nameplates fixed on the machine.

10.4 This machine should not be operated by anyone fitted with a pacemaker.

10.5 Always check the sparking power is off before touching the workpiece or electrode.

10. Operators should wear safety glasses, safety shoes and should remove rings, watches, ewellery and loose fitting clothing for their own protection while operating the machine.

10.7 The machine should not be operated in a potential explosive surrounding. Always clamp the work piece and electrode securely.

10. The safe level of dielectric fluid is a minimum of 40 mm above highest discharge to prevent fire.

10. efore starting the machine, the fire sensor head should be pointed towards the sparking position and a maximum of 20cm from it.

10.10 Maintenance area should be kept free from obstructions, grease and dirt.

10.11 Service or installation of this machine must be performed by ualified personnel only. ollow procedures described in the operating manuals. Turn off and lock out power at the main electrical panel before servicing.

10.12 This machine should be situated at least 3 Metres from other e uipment.

10.13 Make sure all the electrical components are securely grounded.

10.14 The work environment must have ade uate ambient lighting. (over 500 lux)

10.15 Keep the area moderately ventilated, the area should be fitted with an extraction system

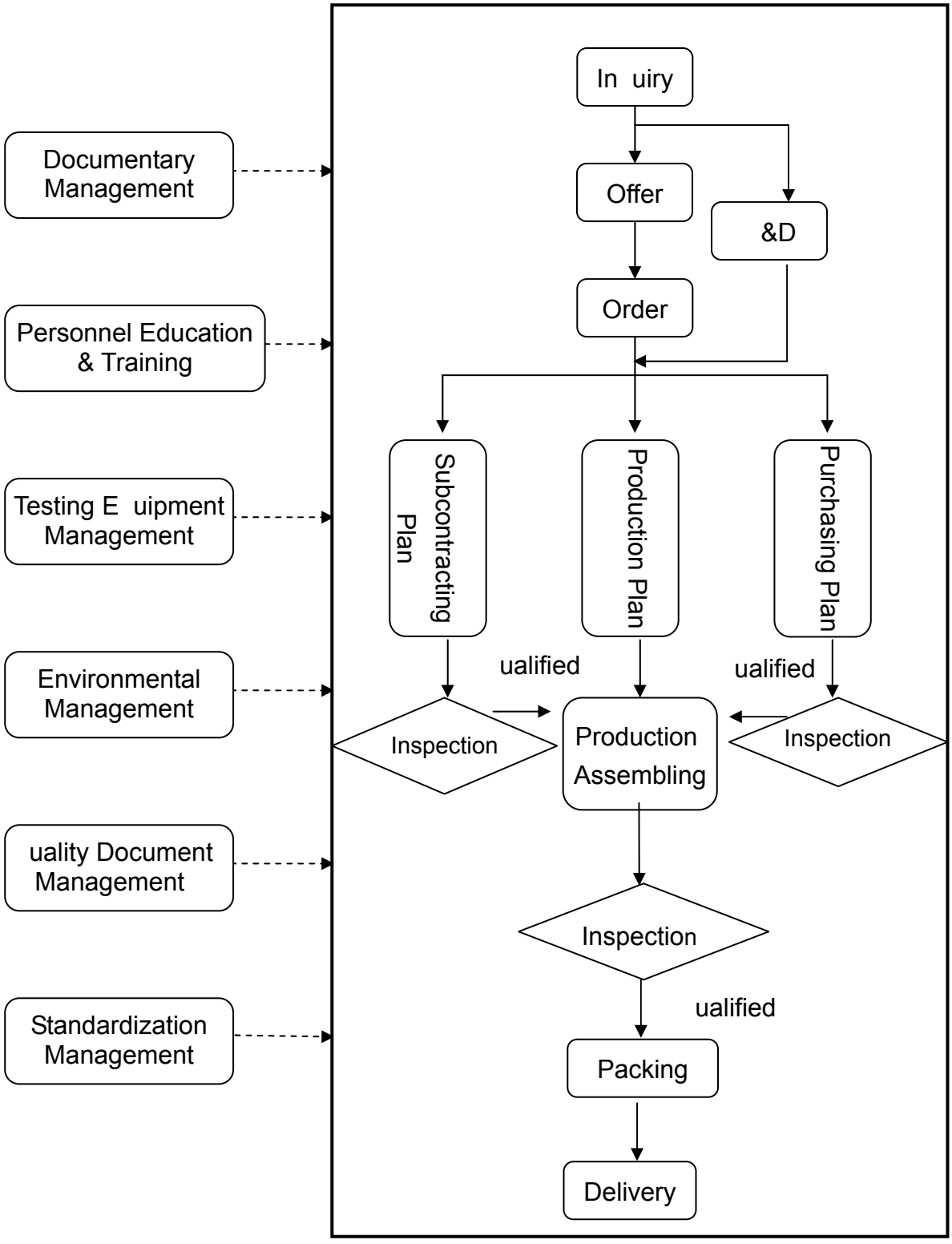
10.1 The waste should be handled in accordance to the environmental safety regulations of the local authority and relevant international provisions.

10.17 Metal connection of external device such as filter system, fume exhaust system, passing through the shielding of the e uipment shall be electrically bonding to the shield (in case of connection to a protruding cap, this bonding is not necessary).

10.1 This machine may interfere with radio broadcast e uipment.

If you have any problems about the safe operation of the machine, refer to your supervisor immediately or consult **ANOTRONIC LIMITED**.

11. Structure of Quality Management：

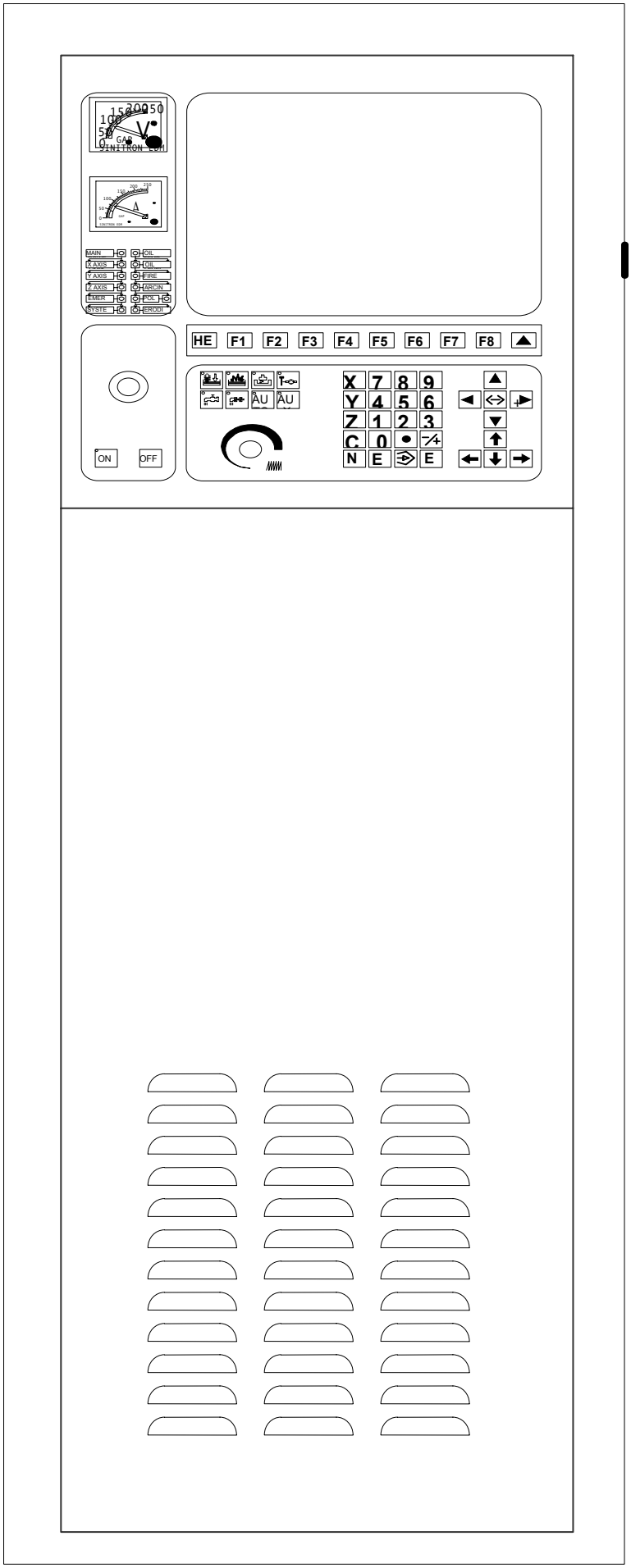


II

PC-Based EDM System

User Manual

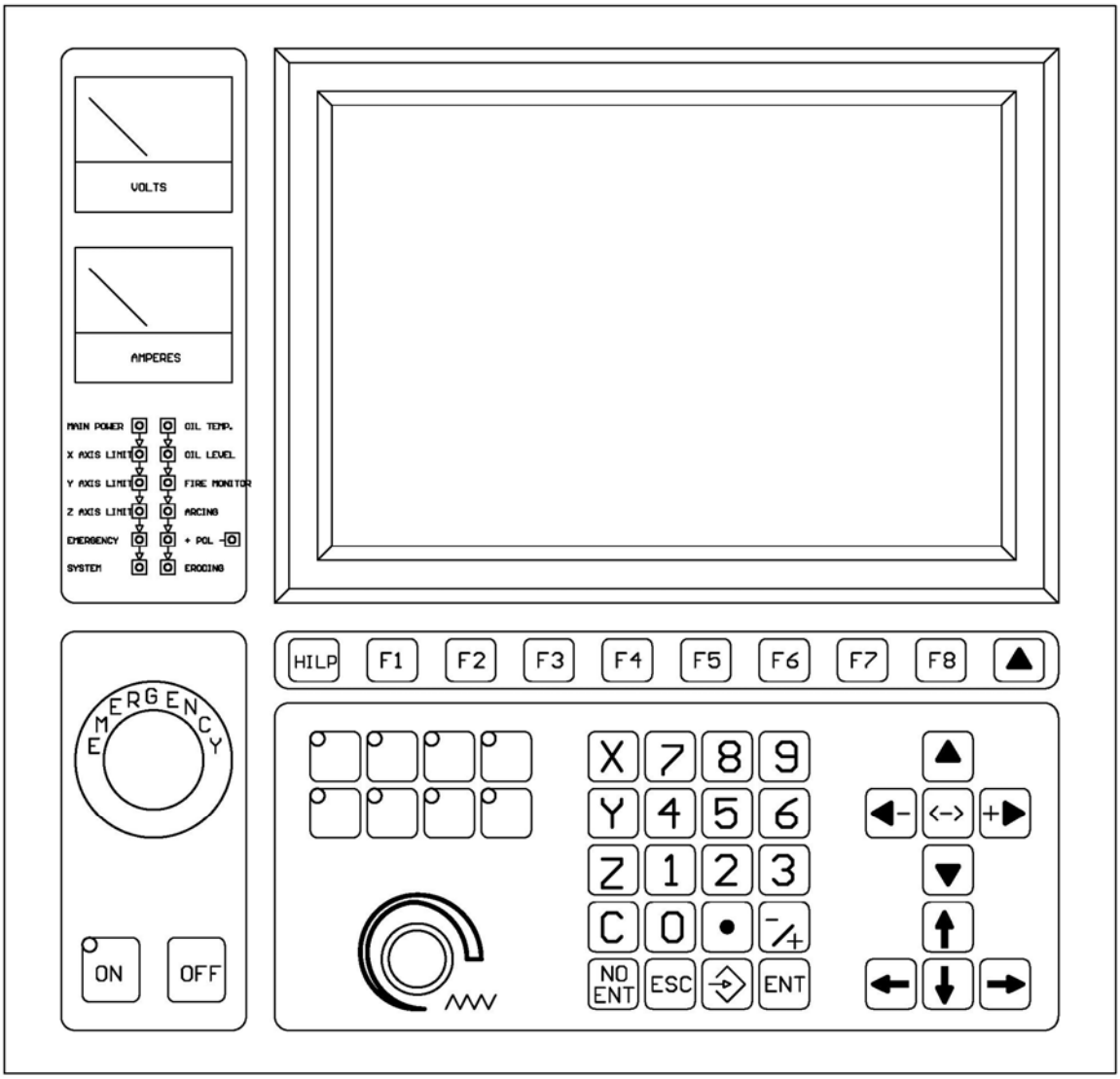
1. Cabinet Layout



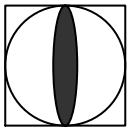
2. Layout of Operating Screen:

MODE	FUNCTION	
F1 : MANUAL :	**F1 : HOME**	**:** Move all Axes to Ref. position.
	F2 : AXIS_MDI	**:** Move X,Y, or Z Axes to new position.
	F3 : DATUM	**:** Working Data setting: 1 ... 20 sets of datum can be set.
	F4 :	
	F5 : OB CEN.	**:** ORBIT Head Auto. Centring (Option)
	F6 :	
	F7 : MP_SET	**:** Machine parameter setting. (Should only be changed by experienced service engineer)
	F8 :	
F2 : PROBE :	**F1 : SURFACE**	**:** Probing 3 axes surface = Datum
	F2 : SPK_TCH.	**:** Sparking touching for alignment
	F3 : AXIS_CEN	**:** Probing externally, Workpiece midpoint = Datum of one axis
	F4 :CAVE_CEN	**:** Probing internally, Circle Centre = Datum
	F5 : CORNER	**:** Probing Corner=Datum
	F6 : SIDE_CEN	**:** Probing Centre point of 4 sides
	F7 : AXIS_POS	**:** "Manual Data Input" for Axis Positioning
	F8 : 1/2	**:** Actual Pos. Data divided by 2. (Centre point data)
F3 : SPK_EDT :	**F1 :**	
	F2 :	
	F3 : INS_BLK	**:** Insert One Sparking Block
	F4 : DEL_BLK	**:** Delete One Sparking Block
	F5 : STOP	**:** Cycle stop at block for intermediate check
	F6 : COD_SAVE	**:** Save the new Sparking Code contents
	F7 :	
F4 : PATTERN :	**POS. (X.Y.Z.) ENT.**	:Multi-cavity position data editing
	F1: MARK_ALL	: Mark whole table data for editing
	F2: MARK ONE	: Mark selected POS. data for editing
	F3: MARK INS	: Insert selected POS. data
	F4: MARK DEL	: Delete selected POS. data
	F5: DATA SET	: Enter new POS. data to all marked data.
	F6: INC DATA	: Adding data to all marked original data
	F7: DATA INC	: Adding all marked data with incremental one by one.
	F8: AUTO CAV	:Multi-cavity position data editing with fixed pattern
		F1 : MATRIX : Matrix pattern
		F2 : PATTERN2 : Pattern with Inserting mid-point of matrix
		F3 : PATTERN3 : Pattern with whole line shifted of matrix
		F4 : SQUARE : Square pattern
		F5 : CIRCULAR : Circular pattern
		F6 : LINEAR : Linear pattern
F5 : RUN	**:** Program Run	
F6 : AUX._SET	**:** Sparking Auxiliary Condition setting	
F7 : SAVE	**:** Saving current system data	
F8 : FILE_EDT	**F1 :**	
	F2 :	
	F3 : COD_EDIT	: Sparking Codes editing
	F4 : TIME_SET	: Time-Control setting (Enable & Timer setting)
	F5 : PGM_DIR	: Program Directory
	F6 : PGM_DEL	: Program Delete
	F7 : PGM_COPY	: Program Copy
	F8 : LODE	

3. *Machine Panel:*



4. Power Switch/ Button:

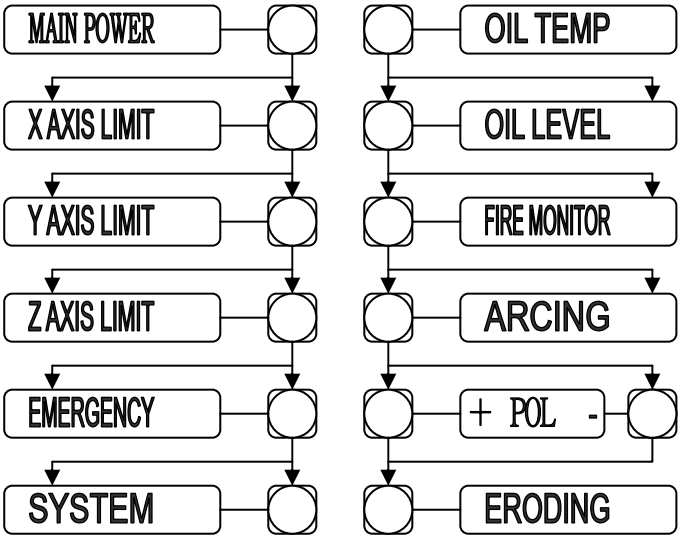


"Main-Power-Switch" (Isolator)
With this switch ON, the PC be ON.

"Power-ON-Button" (Power Enable)
After the PC has booted, press ON to enable Sparking Power and Servo Power.

"Power-OFF-Button"
Sparking Power & Servo Power are turned off when the OFF is pressed.

5. System indicator on Panel:



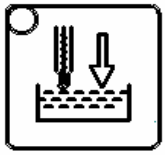
After the Main Power Switch is turned ON, system supervision starts working:

Indicator	*Description*	*Normal*
MAIN POWER	Main Power O.K.	ON
X AXIS LIMIT	X-Axis L.S. not touched	ON
Y AXIS LIMIT	Y-Axis L.S. not touched	ON
X AXIS LIMIT	Z-Axis L.S. not touched	ON
EMERGENCY	No Emergency Stop	ON
SYSTEM	PC Ready	ON

＊Caution：

If any one of the above Green indicators are OFF, then “Power Enable” will fail.

Indicator	*Description*	*Normal*	*Remark*
OIL TEMP.	Dielectric Temperature High	OFF	If ON, then Sparking OFF
OIL LEVEL	Dielectric Level Low	OFF	If ON, then Sparking OFF
FIRE MONITOR	Flame Detected	OFF	If ON, then Sparking OFF
ARCING	Arcing Status	OFF	If ON, then Sparking OFF
＋ POL －	Polarity Command display	ON 1	+ or – Sparking Polarity
ERODING	Sparking Status	ON	Sparking

b 

Dielectric Level & Temperature Supervision ON/OFF

1. Securing dielectric level & Temperature during sparking.
2. Enabled automatically after system Start-up.
3. Sparking turned OFF as soon as alarm occurs.
4. Alarm Indicator ON & Buzzer operates indicating alarm.
5. After alarm problem is cleared, press “ENT” key to clear alarm, “START” button can then be pressed to continue sparking.

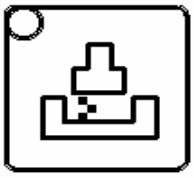
❍ **Indicator for Oil Over-Temperature**

❍ **Indicator for Oil Level Low**

Flame Supervision ON/OFF button

1. Flame detection during sparking.
2. Enabled automatically after system Start-up.
3. Sparking turned OFF as soon as alarm occurs.
4. Alarm Indicator ON & Buzzer indicating alarm.
5. After alarm problem is cleared, press “ENT” key to clear alarm, “START” button can then be pressed to continue sparking.

❍ **Indicator for flame Detection**

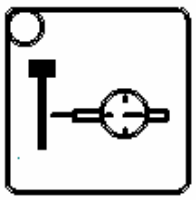


Arcing Supervision ON/OFF button

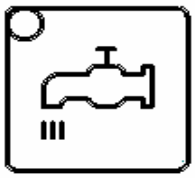
1. Arc detection during sparking.
2. Enabled automatically after system Start-up.
3. Sparking turned OFF as soon as alarm occurs.
4. Alarm Indicator ON & Buzzer indicating alarm.
5. After alarm problem is cleared, press “ENT” key to clear alarm, “START” button can then be pressed to continue sparking.

❍ **Indicator for Arc Detection**

Electrode Alignment button (Short Detection Disable)



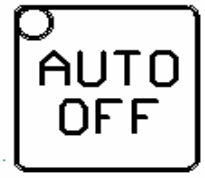
⊙ This function works only in “PROBE” Mode .
⊙ Be careful when traversing axes with this function be activated, there will be **NO Short Detection**.



Dielectric Pump Manual ON/OFF button

Synchronized Flushing ON/OFF button

⊙ Pulsed Flushing when electrode jumps back in Auto Jump cycle (Timer). Better for reducing electrode wear.



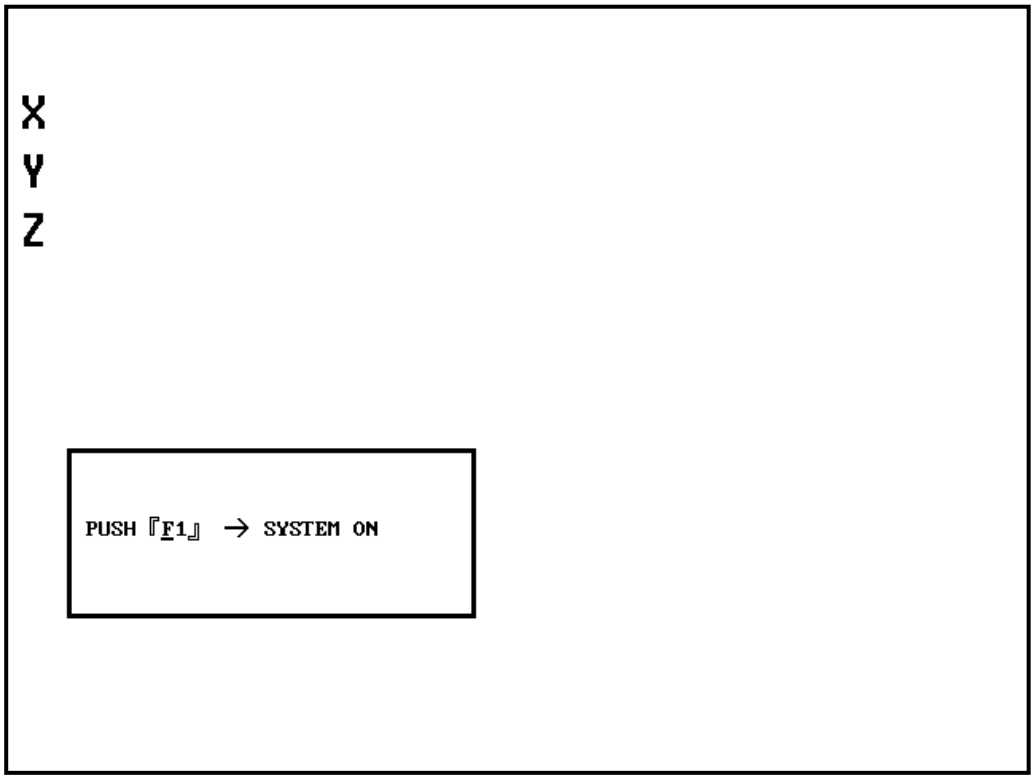
Automatic Power Off button

⊙ Sparking & Servo Power turned OFF when program completed.

Reserved button

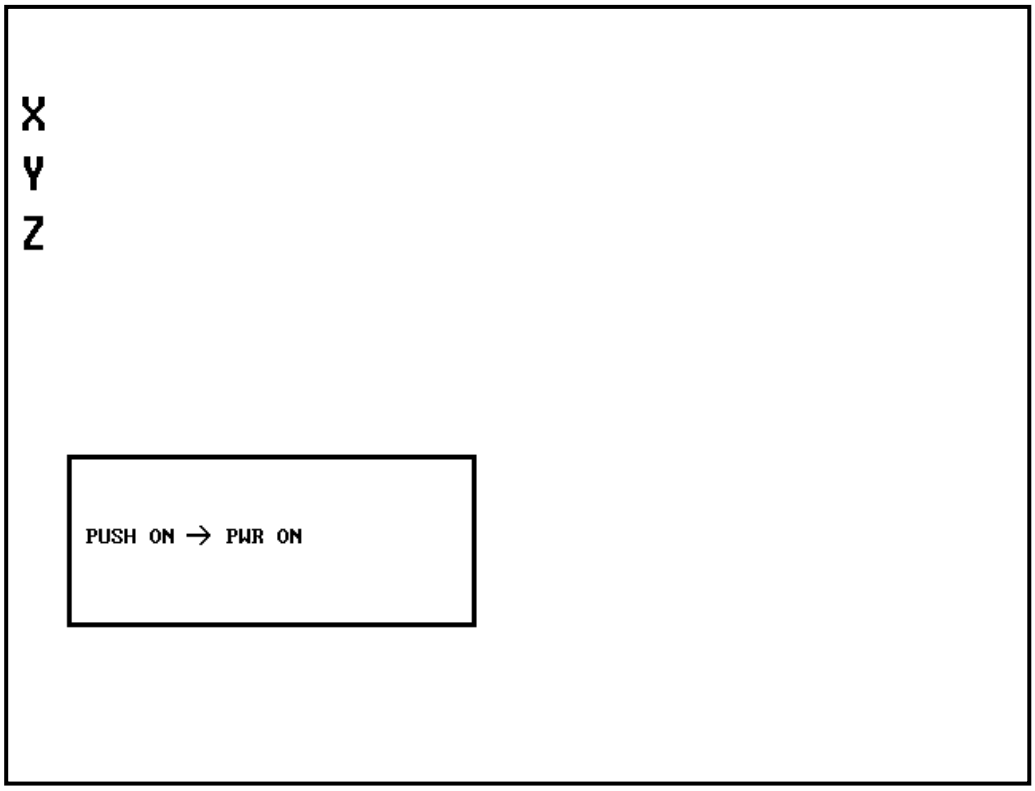
6. System Start-up:

1.Switch ON (in C.W. direction) the Main-Power-Switch that located on the right side of Cabinet. Power for PC will be activated.
2.After PC Self-Diagnosis. The PC Monitor will display:

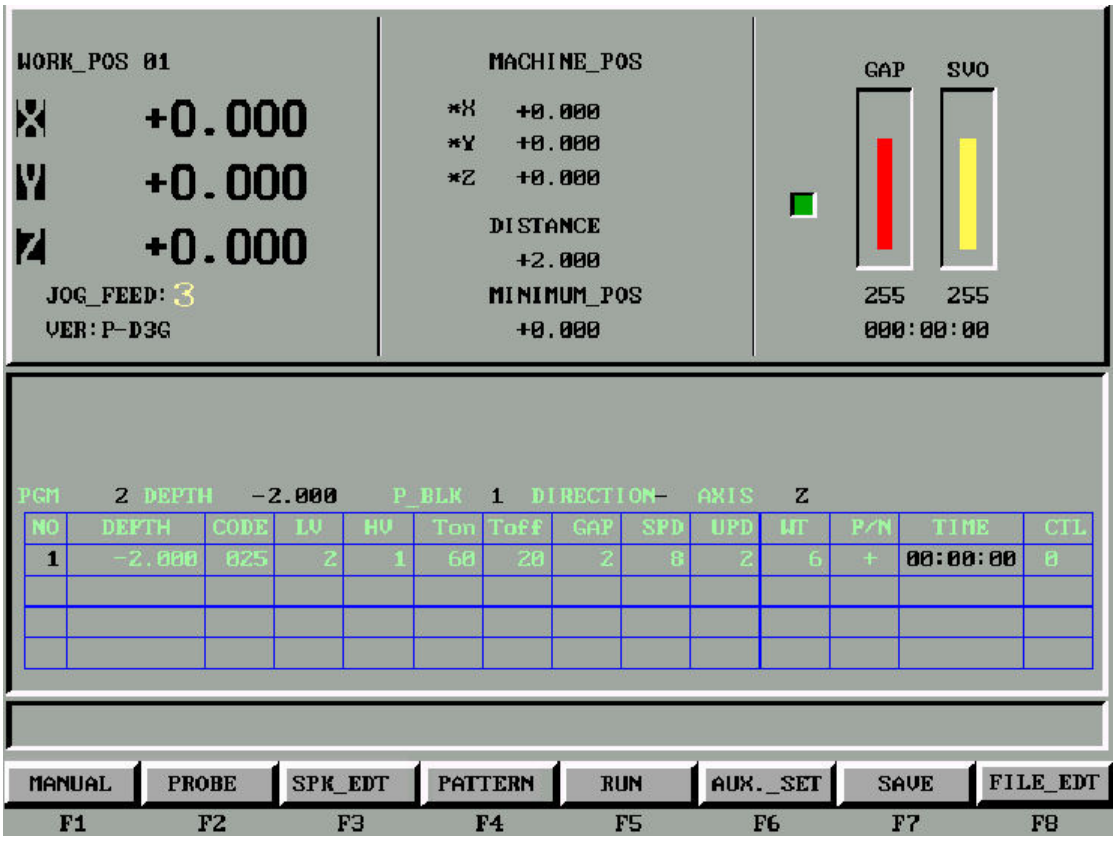


3.Press Function Key “F1” to initiate the EDM PC-Base Control System.
4.Press the “Power-ON-Button” to enable the Power for Sparking & Servo.

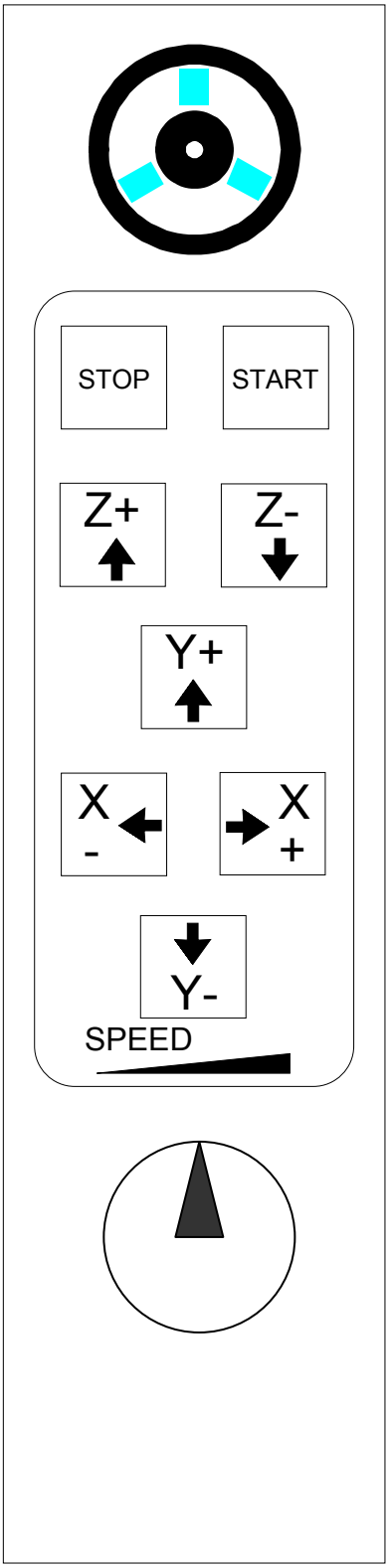
ON



5. System Start-up O.K.



7. Remote Control Box:



Sparking ON

During Sparking, press

Sparking OFF,

resume Sparking ON.

Sparking OFF, Stop Program-Run, “SHORT-Supervision” disable in Manual Mode.

When a Short happens between electrode and workpiece, axes moving is inhibited.

Press “STOP” button and Axis +/- button together to move out of “Short” status. (Normally, “STOP” & “Z+” pressed together).

Sparking Off: After "**STOP**" key is pressed,

Press "**ESC**" key, to activate the "Sparking Off".

Electrode Manual traverse Up

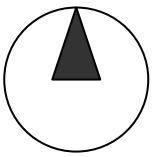
Electrode Manual traverse Down

Electrode Manual traverse in X+ direction

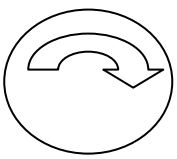
Electrode Manual traverse in X- direction

Electrode Manual traverse in Y+ direction

Electrode Manual traverse in Y- direction

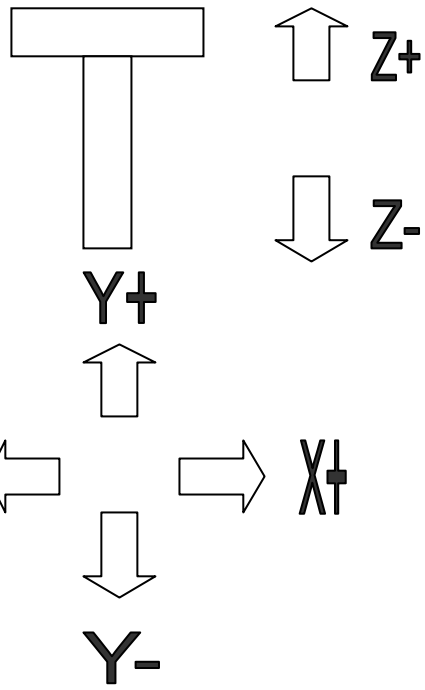


Feed rate override for Manual traverse



Emergency Stop Button

Disable Power, not including Power for PC.



☺ After “Start-Up” succeeded, PC shows the above Main Menu.
System is operational for the following functions:

1.Manual Traverse:

(1).Press one of the Axis keys Z+,Z-,X+,X-,Y+,Y- on Remote Control Box to move Axis.

(2). Feed rate override on the Remote Control Box, shown on PC Monitor “JOG_FEED”

(3). System has “SHORT” security feature, Axis-moving inhibited when “Short” occurs. Press the “STOP” button on Remote Control Box to disable the “SHORT” security feature, with one of the Axis keys to move out of “Short”.

Be careful to press the correct Axis key when a “Short” has occurred.

2. Preset position coordinate:
X or Y or Z, + or -, Number, “ENT”

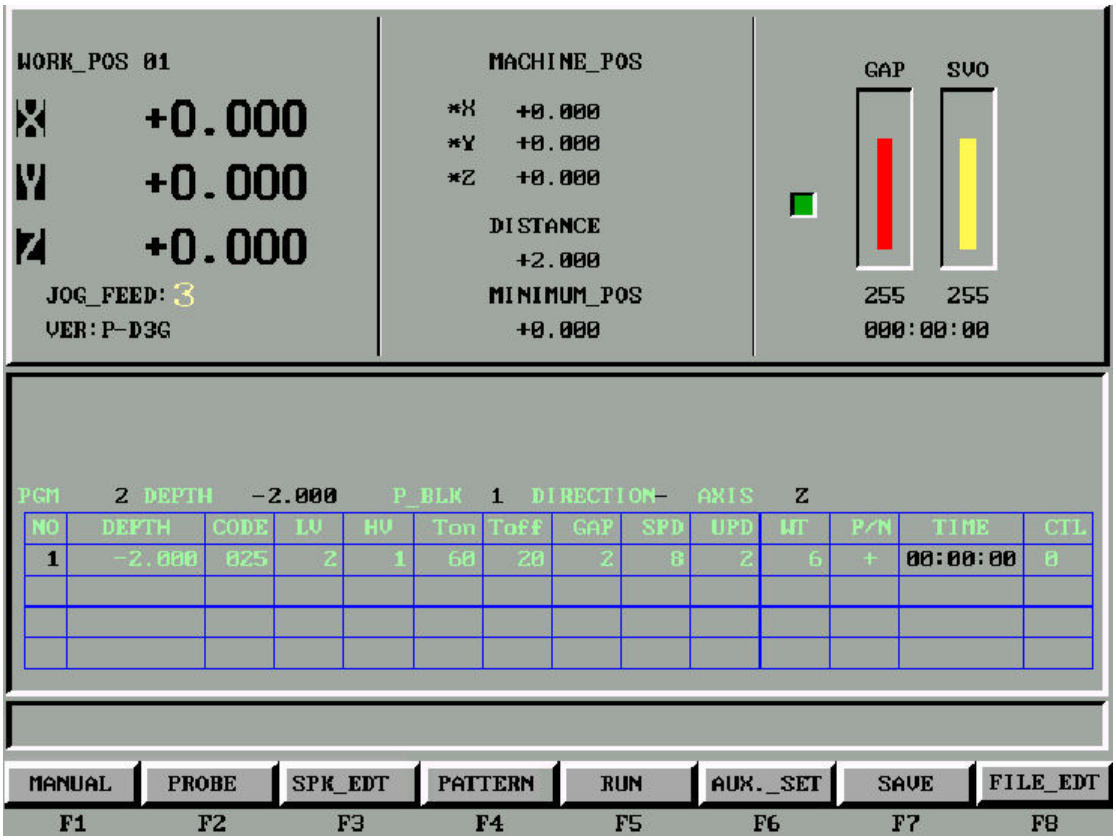
3. Do the Sparking job.

(1). Press “F5” Function key (RUN) or “START” button on Remote Control Box ,to Run the Last Program to Spark. Ensure that the Position data is correct.

(2). Sparking job can be interrupted by “STOP” button on Remote Control Box ,

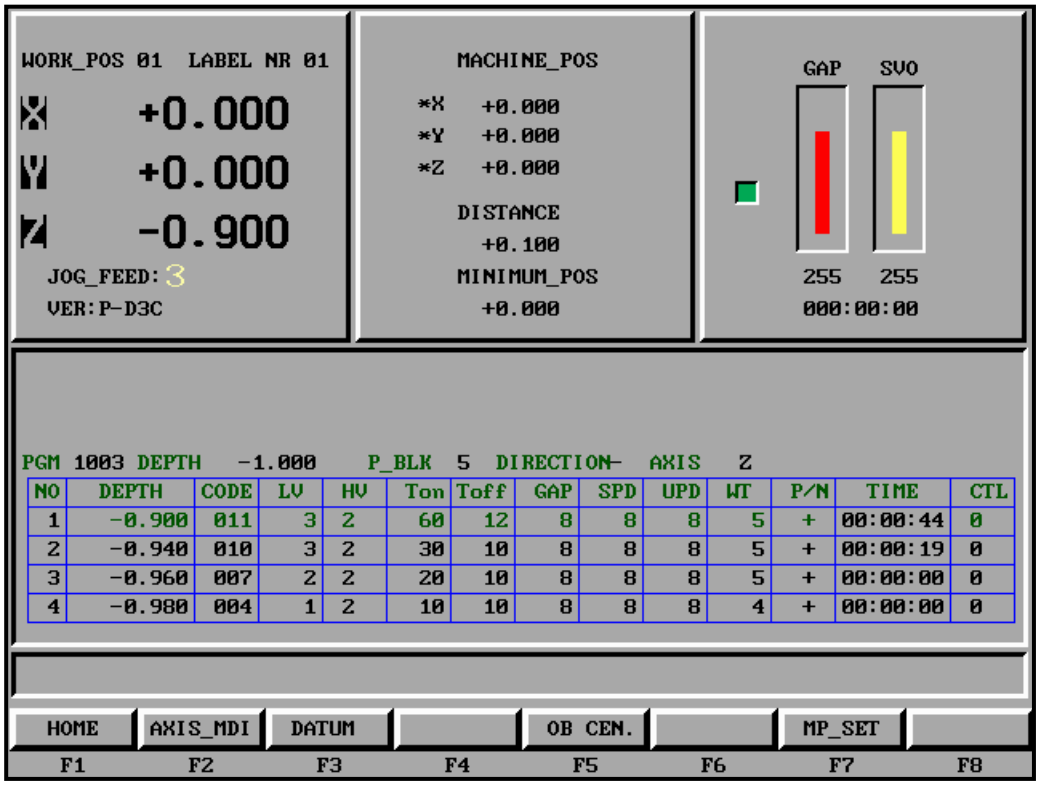
8. Operating Mode:

8.1 Main Menu:



8.2 F1 MANUAL

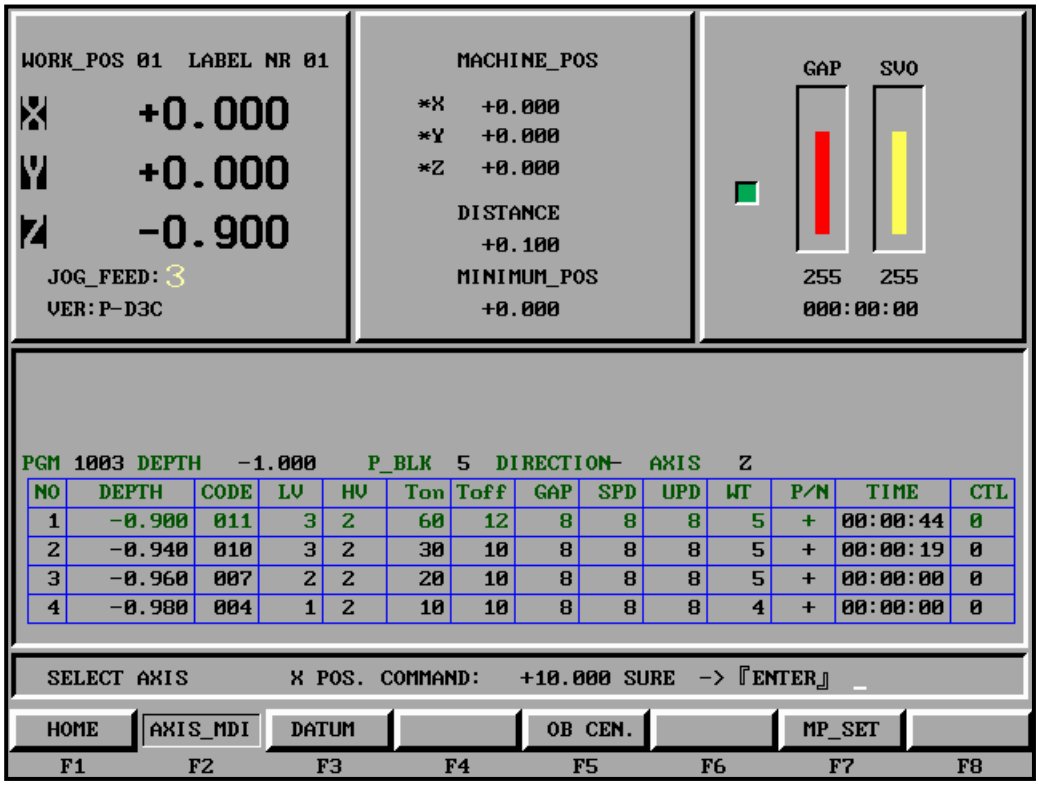
PNC F1 MANUAL :



"F1": "Homing" for Reference Mark Approaching, for Datum Memory

1. Z up automatically, until Limit Switch be reached.
2. X-, Y- automatically, until Limit Switch be reached.
3. 3 Axes move back to look for the Ref. Mark of Encoder automatically, after Ref. Mark be passed over, Axis stops.
   "*" mark before MACHINE_POS disappear means Ref. Mark passed already.
4. WORK_POS displays the Actual position data.
   MACHINE_POS displays the Reference position to Ref. Mark.

AXIS_MDI “F2”: “Axis Positioning” by “Manual Data Input”



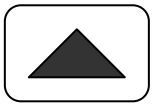
1. Select Axis to move: X or Y or Z
2. Enter the new position, including sign “–“ if necessary.
3. Press “ENT” key.

OB_CEN.

ORBIT-CUT (COC-280) Special Option of OBPNC or OBZNC.

F 5 Pressed for COC-280 Auto. Centring.

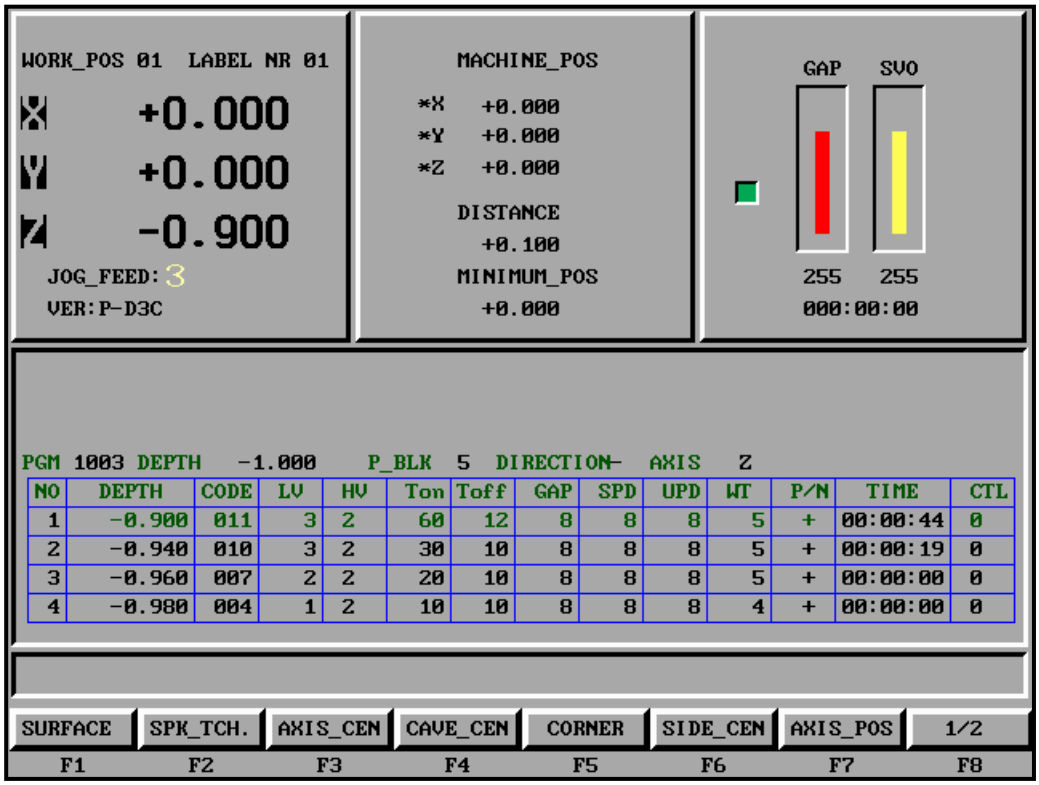
MP_SET is only done by experienced service engineer.



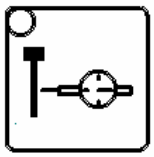
After one option complete, press “▲” key,

back to the Last Menu, ready for the next job.

Auto. Probing Function



1. Calibrating the electrode and aligning the work piece before Probe Mode.
2. Press the “PROBE” key on Operating Panel to disable “Short-Protection” for accurate calibration & alignment.

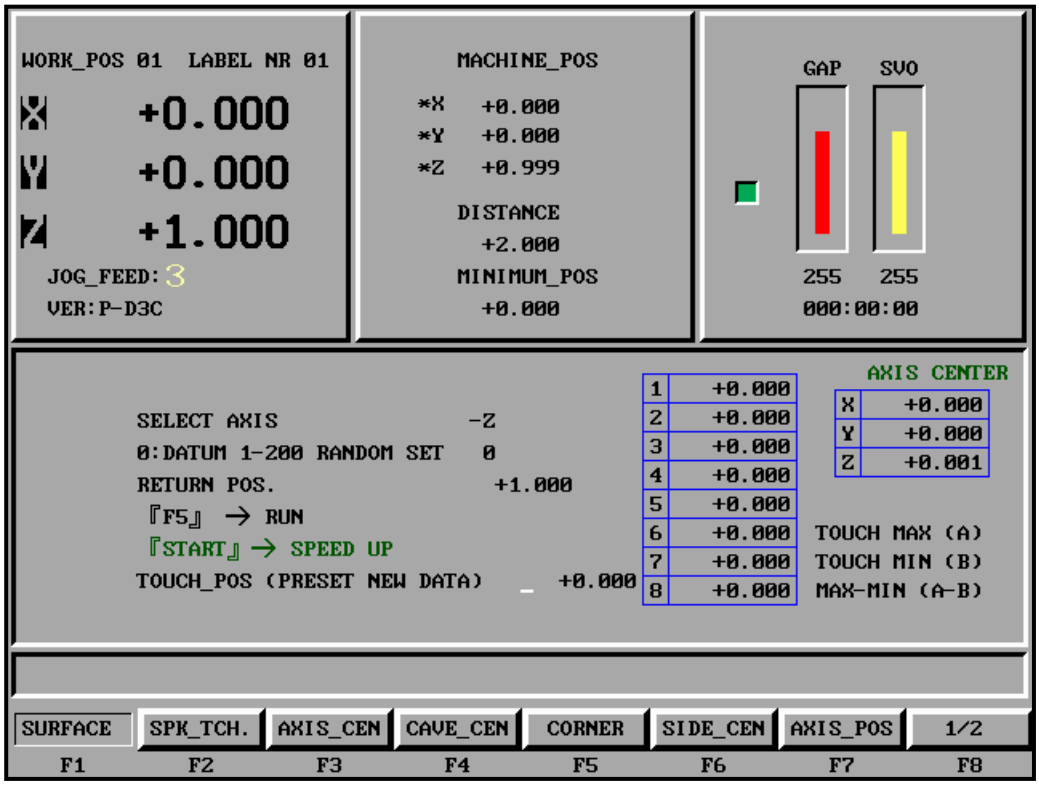


Electrode Alignment button (Short Supervision Disable)

- This function works only in “PROBE” Mode.
- Be careful when traversing axes with this function activated in “PROBE” mode, **there is no “Short” protection.**

SURFACE

"F1" : Probing Edge of 3 axes for "Surface = Datum"



Description:

SELECT AXIS : Choose Axis & Direction

0:DATUM 1-200 RANDOM SET : Reset "0" : Probing point = 0 。
Preset 1-200 : The probing data will be transferred to the corresponding pos. data of pos. table of Pattern.

RETURN POS. : Key in Back Position after Probing, then "ENT"

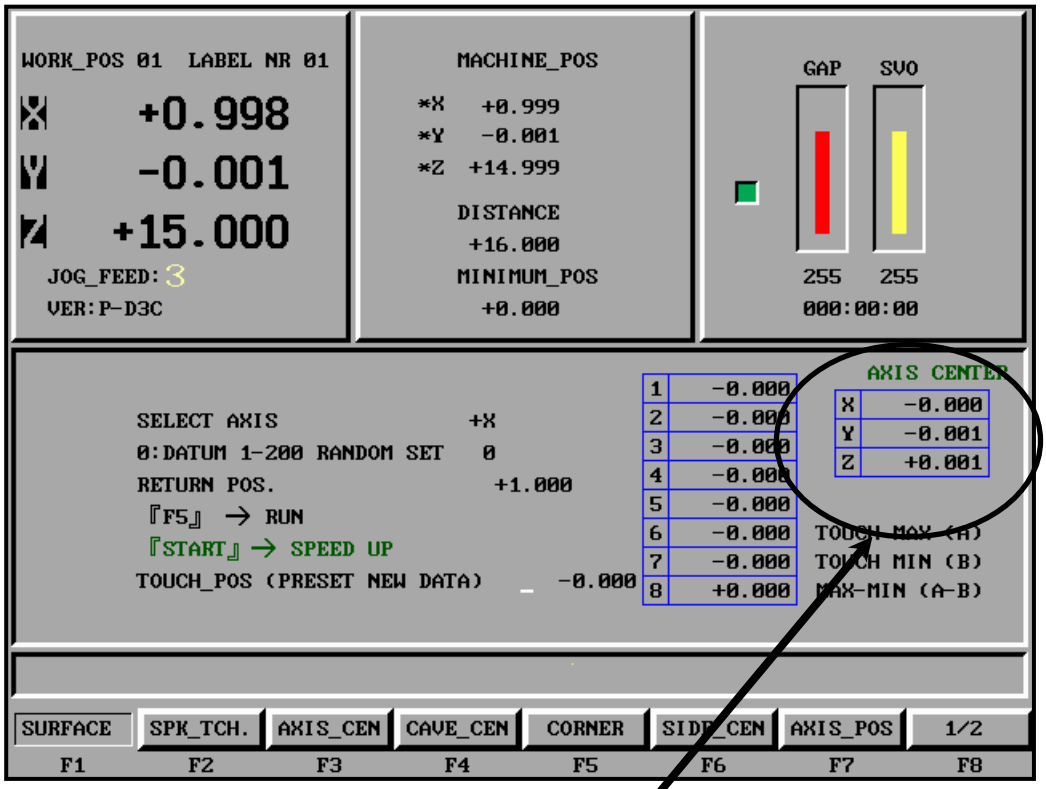
F5 ⟶ RUN : Press "F5", start the probing

START ⟶ SPEED UP : : Press "START" (on Box) to increase Probing speed.

TOUCH_POS (PRESET NEW DATA) : Preset new position data for Touched Edge

SURFACE

"F1" : Probing Edge of 3 axes for "Surface = Datum"

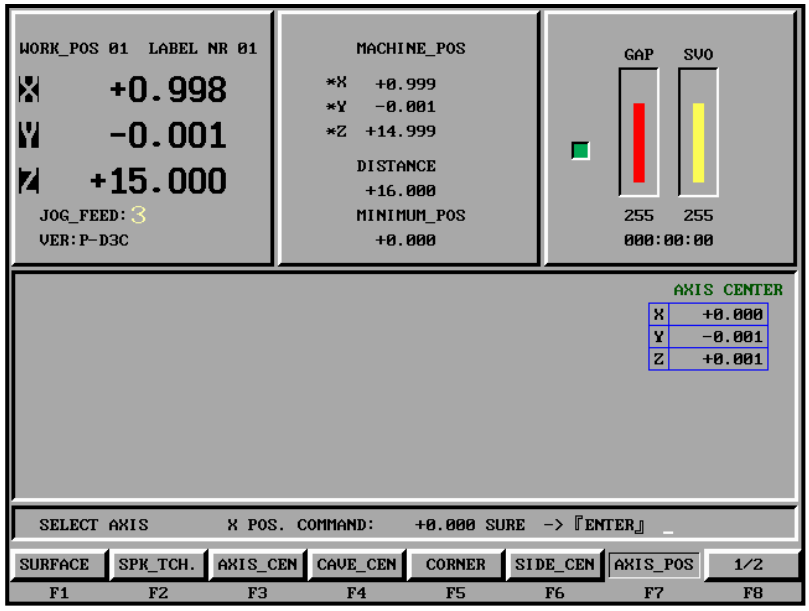


Measuring (Auto. Probing) for large Mould (Work piece):.

Do the "**SURFACE**" probing twice for each axis, the average data will show on the table of each.

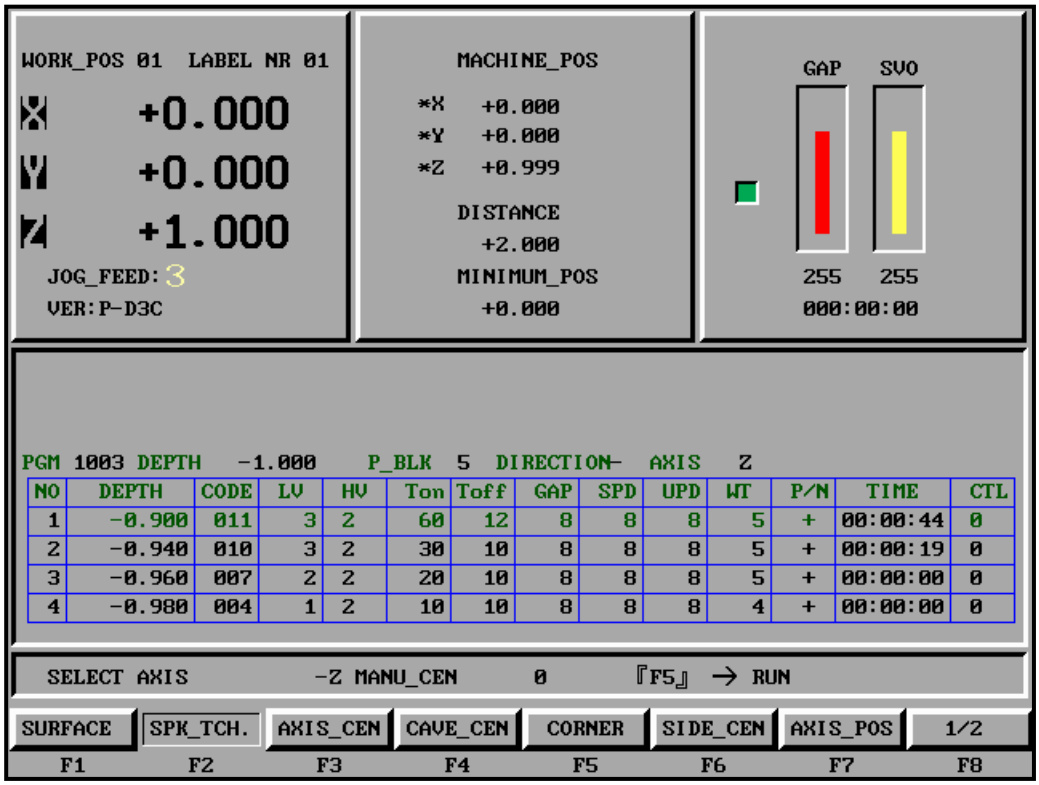
"**AXIS CENTER**" at the upper-right corner of CRT.

Press "**F7**" (**AXIS_POS**), and key in this **Axis & Centre Data** to move the axis to the CENTRE point by control. Then you can reset its data be the **new Datum**.



SPK_TCH

"F2": "Sparking Touch" for Probing



Caution: Sparking Probing with low JOG_FEED & low LV code.

SELECT AXIS： Choose Axis & Direction.

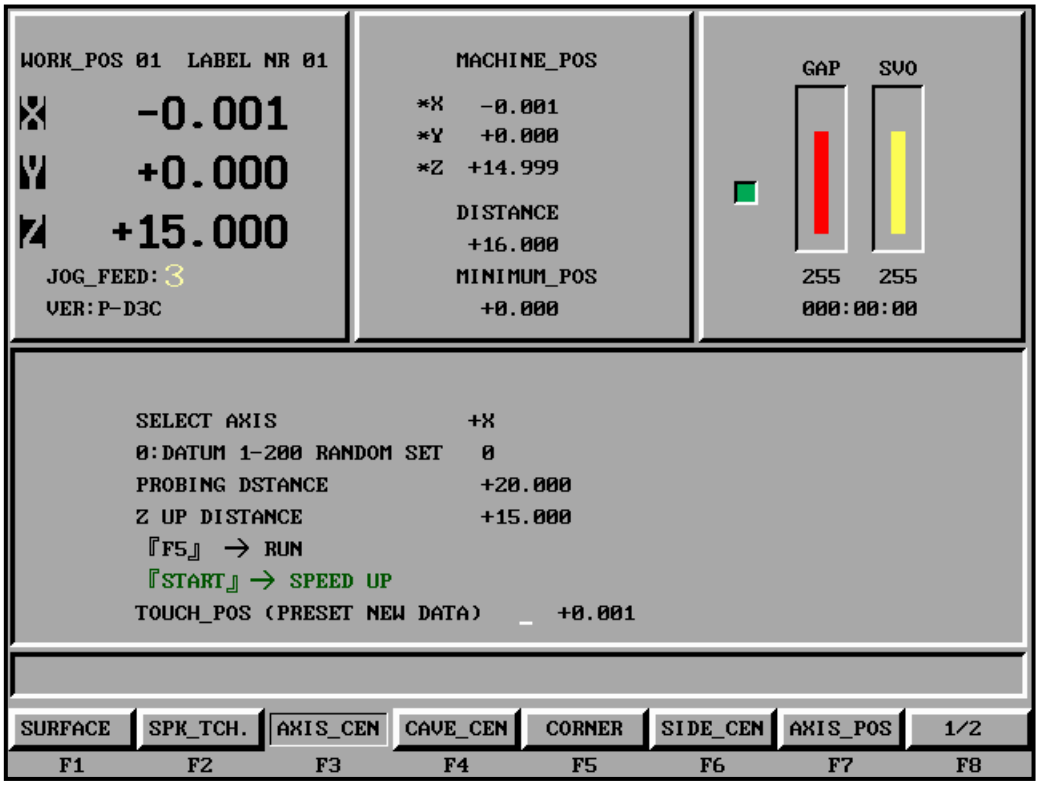
F5 RUN After sparking codes, axis & direction decided, press F5 to run

Press START to start probing with sparking ON.

1. Waiting until electrode touches the work piece, sparking occurs.
2. Reduce the JOG_FEED = 0 ～ 1
3. Jogging axes with (X+,X-,Y+,Y-) keys, watching the spark, until the axes have moved to the wanted position.
4. Press STOP to finish the sparking probing.
5. Press ▲ back to previous page, set the new Data.

AXIS_CEN

"F3": Axis Centring by probing both external sides of work piece

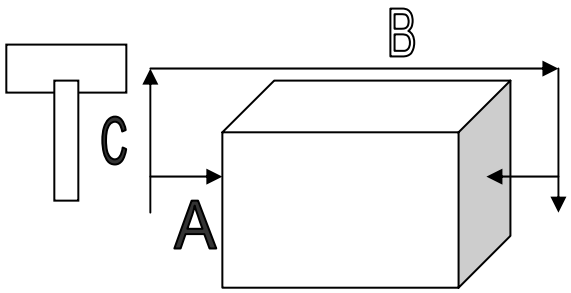


Move the electrode to the start point above work piece, press F 2 PROBE, then F3

(A) Procedure: :

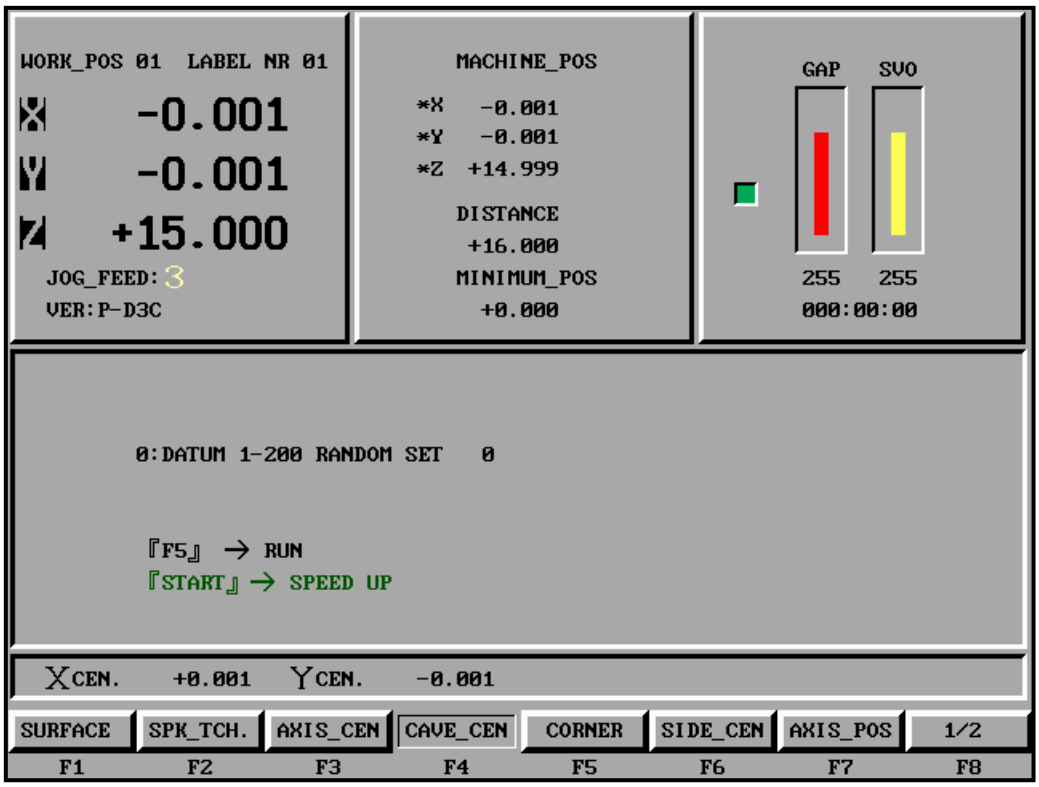
SELECT AXIS	:Choose Axis & Direction
0:DATUM 1-200 RANDOM SET	:Reset "0"：Probing point = 0 Preset 1-200 ：The probing data will be transferred to the corresponding pos. data of pos. table of the Pattern.
PROBING DISTANCE	:Probing distance (B)
Z UP DISTANCE	:Z up position during probing (C)
F 5 → RUN	:Press "F5" to start probing cycle
START→ SPEED UP	:Press "START" to increase probing speed

TOUCH_POS (PRESET NEW DATA) : Preset new Axis Centre Position Data



CAVE_CEN

"F4": Cavity Centring by probing the Cavity internally.

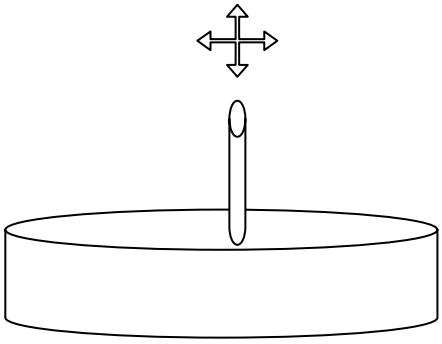


Manual traverse the electrode into the cavity, press F4 CAVE_CEN

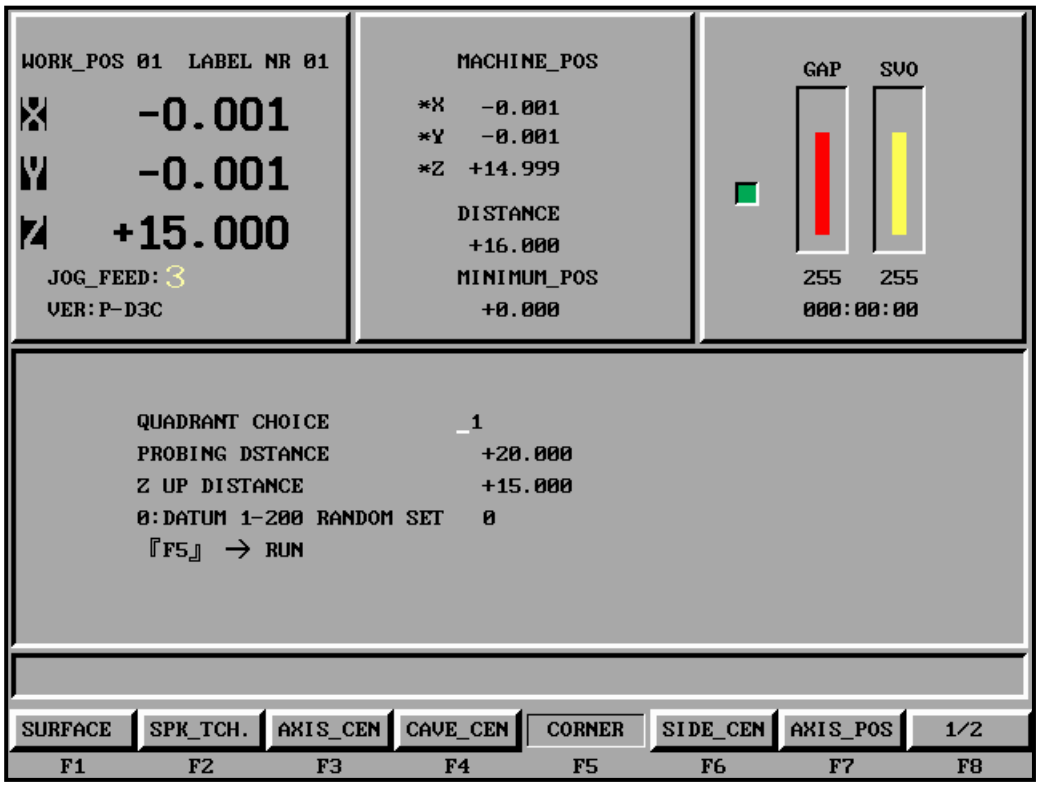
Available for square or circular cavities.

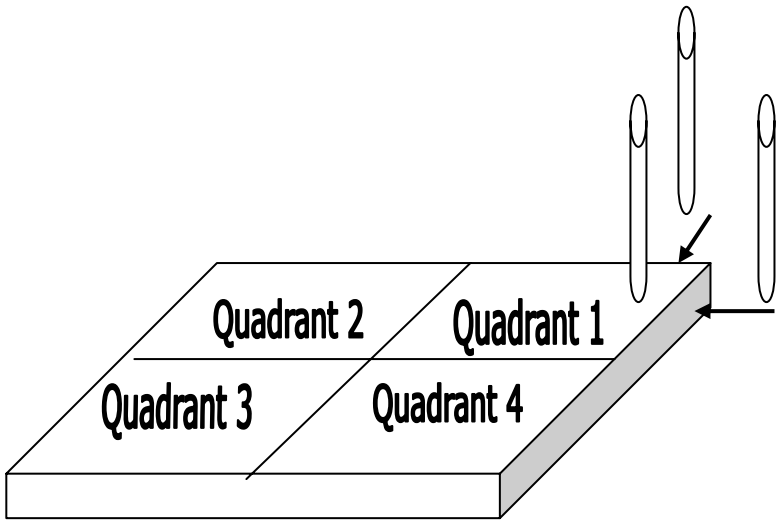
Procedure:

1. 0:DATUM 1-200 RANDOM SET :Reset "0": Probing point = 0。
   Preset 1-200 : The probing data will be transferred to the corresponding pos. data of pos. table of the Pattern.
2. Press F5 to start the auto cavity centring.
   Press "START" to increase probing speed
3 Eventually stop at the Cavity centre. Preset a new position data be Datum



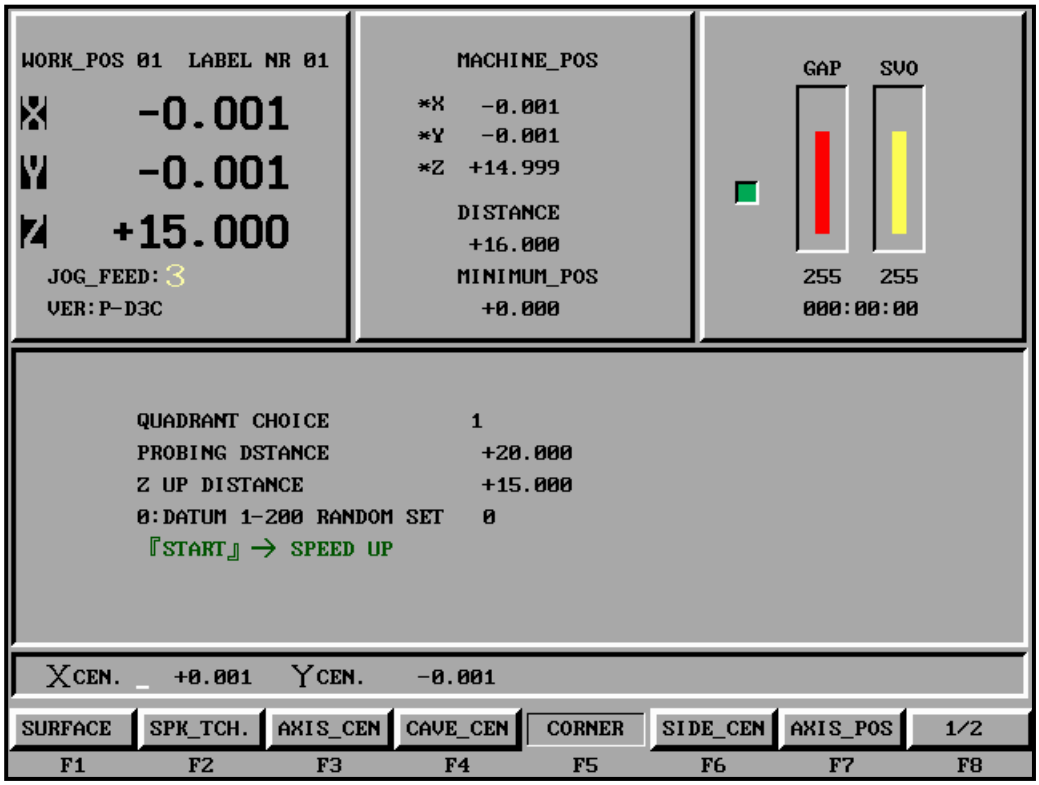
PNC F2→F5　PROBE→CORNER:





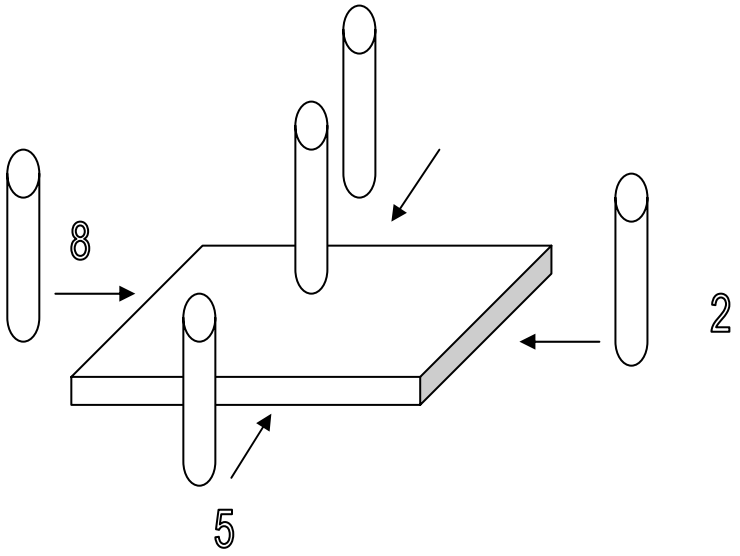
QUADRANT CHOICE	:4 corner (1,2,3,4) can be selected for probing
PROBING DISTANCE	:Entering the bigger rough range of X and Y distance
Z UP DISTANCE	:Down-Distance of Z-axis for probing
0:DATUM 1-200 RANDOM SET	:Reset “0”：Probing point = 0 Preset 1-200 ：The probing data will be transferred to the corresponding pos. data of pos. table of Pattern.
F 5 → RUN	:Press “F5” to start probing cycle

After Corner probed automatically, the display shows:



XCEN. _ : YCEN. _ :

Preset new data or Reset 0 , press ENT to finish the probing cycle.



Manual traverse electrode to the rough centre,
above the work piece. Press F6 (SIDE_CEN)

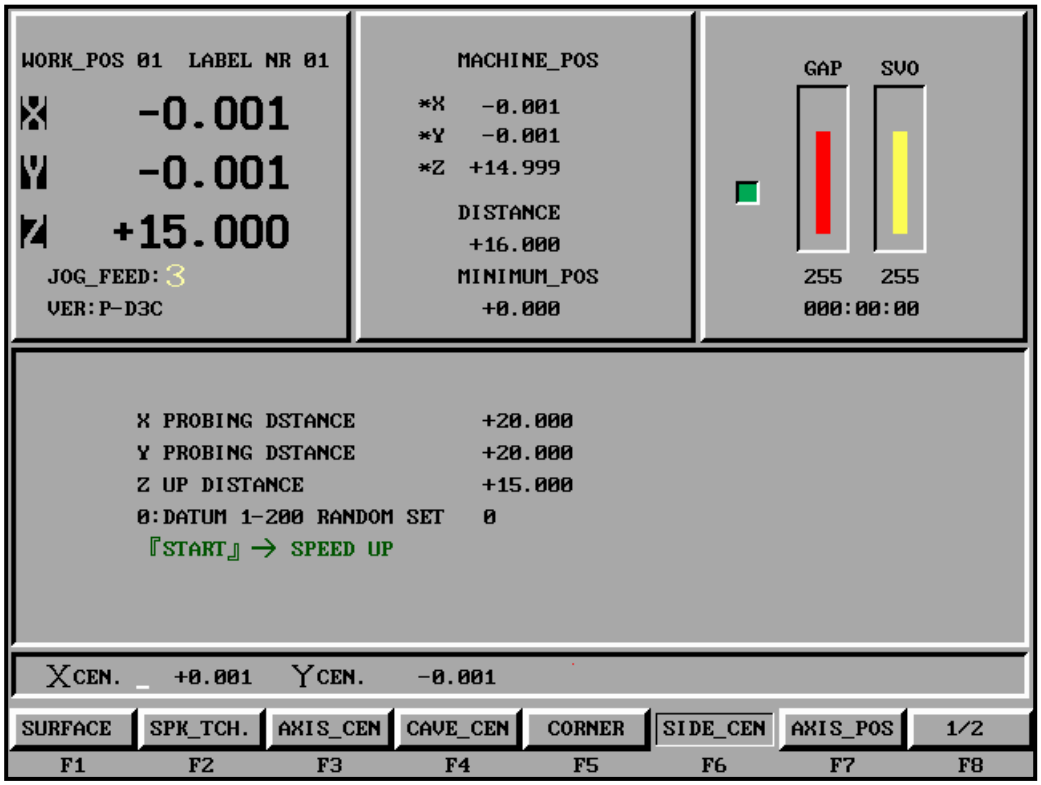
Procedures:

1. X PROBING DISTANCE Enter the X width + electrode radius +10 (safety clearance)
2. Y PROBING DISTANCE Enter the Y width + electrode radius +10 (safety clearance)
3. Z UP DISTANCE Down-Distance of Z-axis for probing
4. 0:DATUM 1-200 RANDOM SET：Reset “0”：Probing point = 0
   Preset 1-200 ：The probing data will be transferred to the corresponding pos. data of pos. table of the Pattern.
5. F 5 ⟶ RUN : Press “F5” to start probing cycle
   Press “START” to increase probing speed

SIDE_CEN

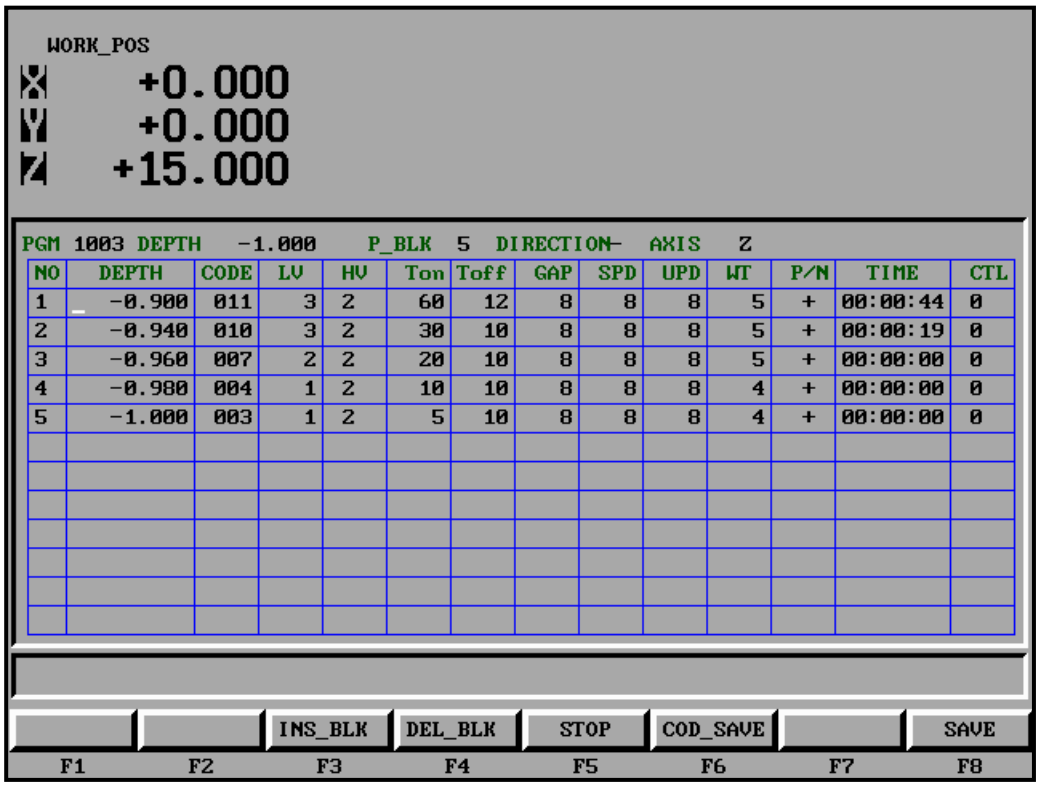
PNC F2→F6 PROBE→SIDE_CEN:

After SIDE_CEN is finished, display shows:



XCEN. _ : YCEN. _ :

Preset new data or Reset 0 , press ENT to finish the probing cycle.



- Move the cursor to somewhere of program format to preset new data:

1. **PGM**: Program Number 1 ～ 9999
   Existing, suggesting Program Nr. in Buffer Memory:
   1001 ～1025 ：Copper — Steel, 1A—25A
   2001 ～2060 ：Graphite — Steel, 1A — 60A
   Entering the existing program for the wanted Current Code, and Depth command, the program can then be run.
   For instance: 6A from rough to fine finish, 10 MM Depth, Copper -- Steel
   1) PGM: 1006 “ENT” (loading the existing program from Memory)
   2) DEPTH: -10 “ENT”
   3) “START” or “RUN” (Start Sparking)

2. **DEPTH**: Sparking depth command, Range +/- 999.999
   Sparking up be possible when “Depth” command higher than current WORK-POS.

3. **P-BLK:** Total block Nr. in program, calculated by PC itself.

4. **DIRECTION**: Sparking direction, defaulted “—”

5. **AXIS**: Sparking Axis, all of X, Y, Z be available for PNC, Z only for ZNC.

☺ ERODING TABLE:

1.**DEPTH**: Depth command for each block of program.
All the depth commands must be logical.

2.**CODE**: Sparking code command. Sparking codes stored in buffer memory.
The contents can be modified when spark is off.
Using the key [← -] 、[+→] to search code or enter the code Nr. directly.

- Please refer to the "COD_EDIT".

3.**LV**: Low Voltage Current command, Standard range 0-64 A.
1) Can be modified only when spark is off.
2) Bigger LV, then bigger spark, quicker, bigger gap, but rougher.
Smaller LV, then smaller spark, slower, smaller gap, better surface finish.
Caution: When large LV is set, the security must be paid attention to especially Flame, Dielectric Level and Dielectric Temperature
3) Only when matched well with Ton & Toff, better working efficiency will be achieved.
4) Enter value directly or use [← -] 、[+→] keys to fetch data.

4.**HV**: High Voltage Current
1) Range 0 - 7
2) Bigger HV, then bigger spark, quicker, bigger gap, but rougher.
Smaller HV, then smaller spark, slower, smaller gap, better surface
.
finish.
3) Enter value directly or use [← -] 、[+→] keys to fetch data.
4) Application:
(1).Working with LV
(2). "HV" only, with Positive Discharge for fine finish.
(3). "HV" only, with Negative Discharge for fine finish.

5.**Ton**: "ON" duty of Sparking cycle.
1) Range 1 - 2000us, divided into 48steps.
2) Comparing with constant LV command,
Bigger Ton, then rougher finish, bigger gap, lower wear ratio.
Smaller Ton, then better finish, smaller gap, higher wear ratio.
3) Ton set by pressing [← -] 、[+→] keys to fetch data.

6.**Toff**: "OFF" duty of Sparking cycle.
1) Range 1 - 255 us, real data display.
2) Comparing with constant LV & Ton commands,
Smaller Toff, then quicker, but debris removal not easy.
Bigger Toff, then slower, but debris removal easier.
3) Enter value directly or use [← -] 、[+→] keys to fetch data.

***Caution*: There is a rough formula between Ton vs LV for good sparking performance:**

Copper → Steel, Rough eroding, Low wear-ratio, Ton/LV about 30
Medium eroding, medium wear, Ton/LV about 20 - 25
Finish eroding, higher wear, Ton/LV about 10 - 15

Suggesting table between LV & Ton for lower Copper electrode wear-ratio:

	0	1	2	3	4	5	6	7	8	9
0		30	60	90	125	150	175	200	200	250
10	300	300	350	350	400	450	450	500	500	550
20	600	600	650	650	700	750	750	800	800	850
30	900	900	950	950	1000	1000	1000	1100	1100	1100
40	1200	1200	1200	1200	1300	1300	1300	1400	1400	1400
50	1500	1500	1500	1500	1600	1600	1600	1600	1700	1700
60	1800	1800	1800	1800	1800					

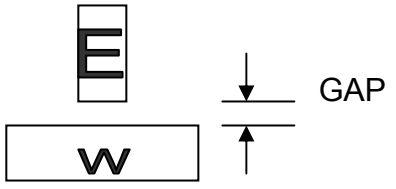
Graphite→Steel, Rough eroding, Low wear-ratio, Ton/LV about 25
Medium eroding, medium wear, Ton/LV about 15 - 20
Finish eroding, higher wear, Ton/LV about 5 - 10

Suggesting table between LV & Ton for lower Graphite electrode wear-ratio:

	0	1	2	3	4	5	6	7	8	9
0		25	50	70	100	120	150	125	200	200
10	250	250	300	300	350	350	400	400	450	450
20	500	500	550	550	600	600	650	650	700	700
30	700	700	800	800	800	800	900	900	900	900
40	1000	1000	1000	1000	1100	1100	1100	1100	1100	1100
50	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200
60	1200	1200	1200	1200	1200					

7.**GAP**: Gap Voltage setting for retracting control.

1) Range 0 – 15
2) Smaller GAP, then smaller sparking gap, quicker, not easy to remove debris.
Bigger GAP, then bigger sparking gap, slower, easier to remove debris.



3) GAP data set by pressing [← -] 、[+ →] keys to fetch data.

SPK_EDT

8.**SPD**: Speed of Auto. Jump.
1) Range 0 – 15
2) Smaller SPD, then slower jump for bigger area of electrode and fine sparking.
3) Bigger SPD, then quicker jump for long electrode doing deep sparking, for longer jump distance, for easier debris removal.
4) Matched well with UPD & WT, better efficiency achieved.
5) Enter data directly or use ← - 、 + → keys to fetch data.

9.**UPD**: jump UP Distance
1) Range 1 – 255 steps
2) Smaller UPD, then save dry-run time.
Bigger UPD, then waste longer dry-run time.
3) Enter data directly or use ← - 、 + → keys to fetch data.

10.**WT**: Working Time after auto. Jump
1) Range 1 – 255 steps, WT=0 means no Auto. jump
2) Smaller WT, then shorter working time, easier for debris removal.
Bigger WT, then longer working time, harder for debris removal.
3) Enter data directly or use ← - 、 + → keys to fetch data.

11.**P/N**: discharge Polarity
1) "+": Electrode be positive polarity, "-" : Electrode be Negative polarity
2) Changing the setting by ← - 、 + → key

12.**TIME**: TIME record of each block of sparking program. Calculated by PC itself.

13.**CTL**: ConTroL of Z_LOCK ON/OFF for extra external Orbit Head function.
1：Orbit Head activated, 0：Orbit Head OFF

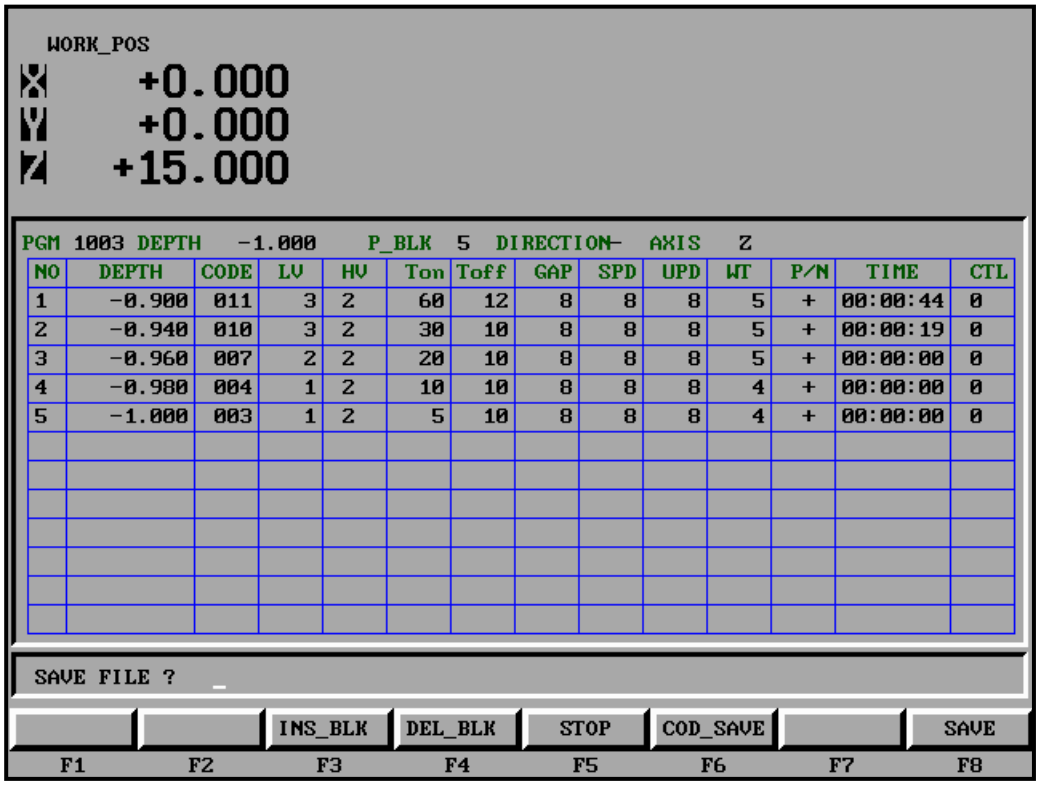
INS_BLK "F3"：INSert 1 block in program.

DEL_BLK "F4"：DELete 1 block in program.

STOP "F5"：Feed Hold when this block finished.

SAVE "F8"：**SAVE** the Sparking CODE DATA to its corresponding CODE TABLE In memory. it will overwrite the old CODE DATA in memory.

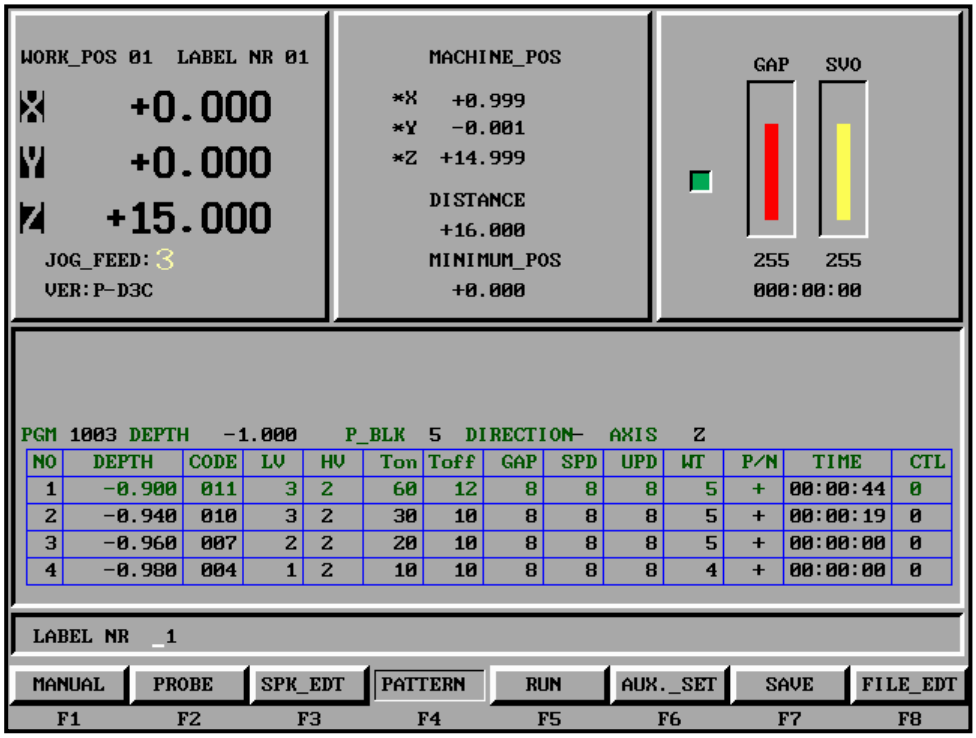
SPK_EDT



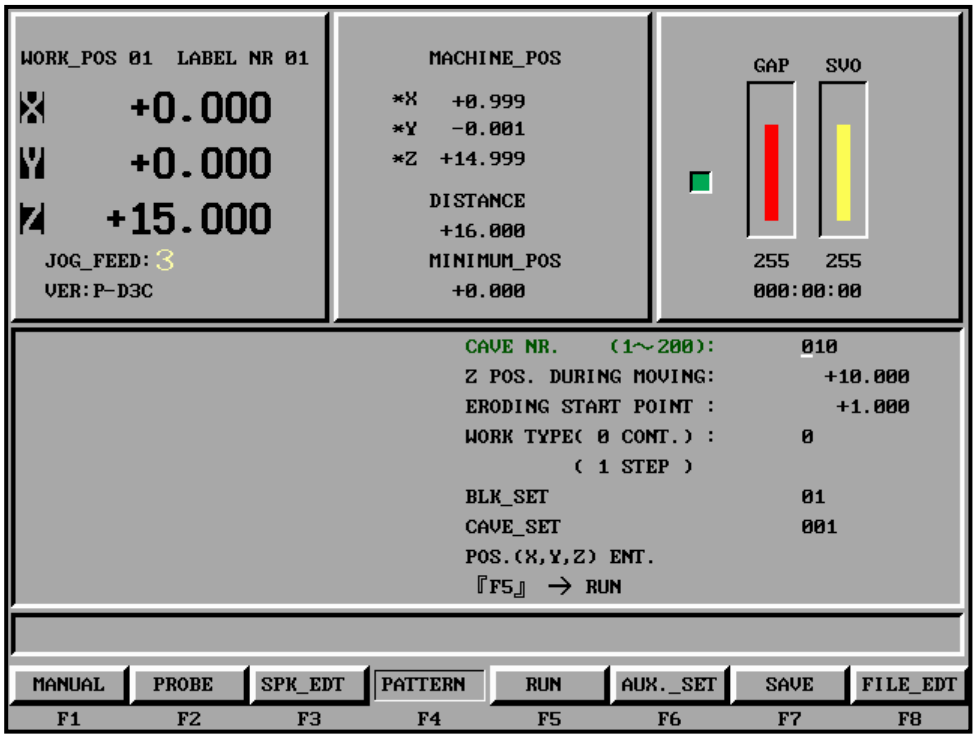
After editing, press ▲ key to exit.
Press "Y" key to save new CODE data to CODE Table in memory, then return to main menu.

Press NO ENT key to not save and return to main menu..

PNC F4 PATTERN MODE :

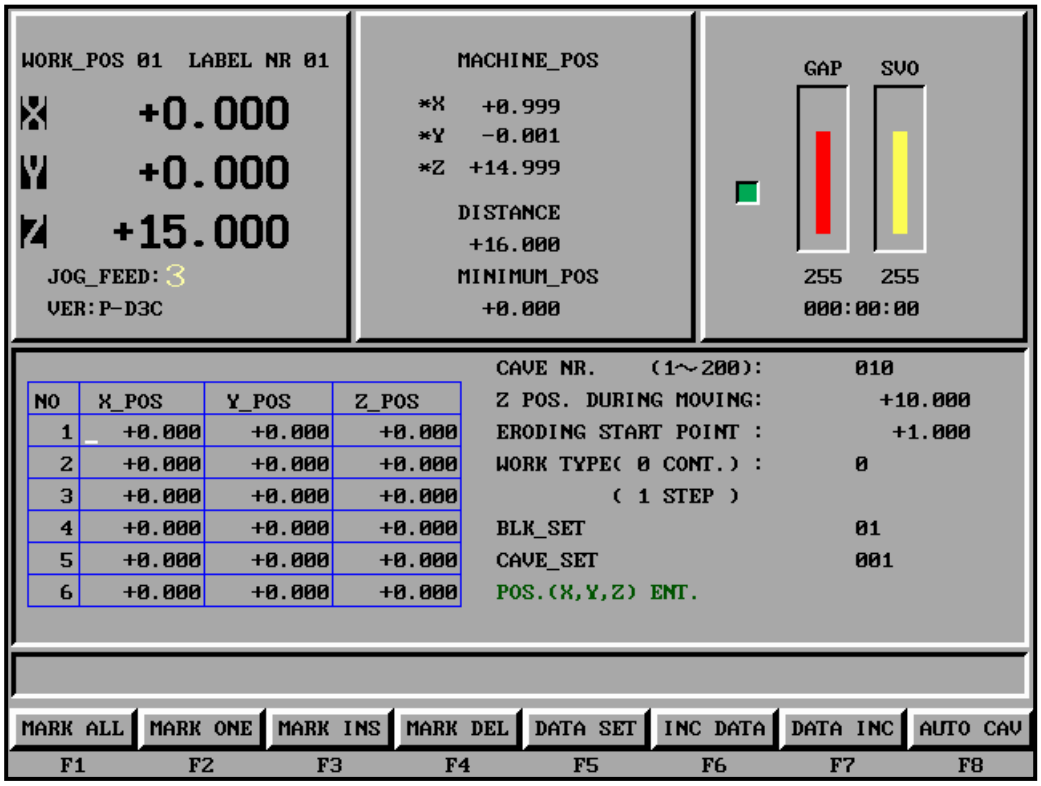


Press "PATTERN" for multi-cavity editing: key in the sub-program Number.
now you can set up max. 20 sets of multi-cavity pattern forms and be stored in memory.
Pressing "ENT" key to enter PATTERN programming menu to start editing



1、 **For multi-cavity sparking, editing the Sparking Codes and Depth.**
2、 **F4 to edit the multi cavity sparking position pattern and sparking types.**
3、 **There are some fixed patterns available. (AUTO_CAV).**
4、 **After pattern editing finished, press [▲] , back to previous page.**
5、 **Press [F5] to run the multi-cavity sparking.**

PNC F4 PATTERN MODE :



1、Follow the dialogue to edit the Pattern mode

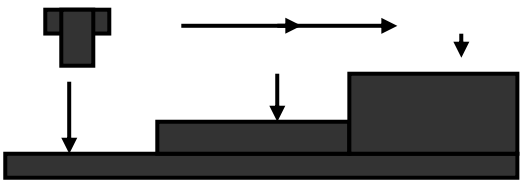
2、The POS. table of pattern (Max. 200 POS.) will be positioning & sparking.

3、C*aution*：When sparking, the Z POS. in the pattern POS. table is the start sparking point, and the DEPTH in Sparking PGM will be the distance to spark.(Incremental)

4、The POS. table can be random editing or edited by F8 AUTO_CAV into fixed pattern.

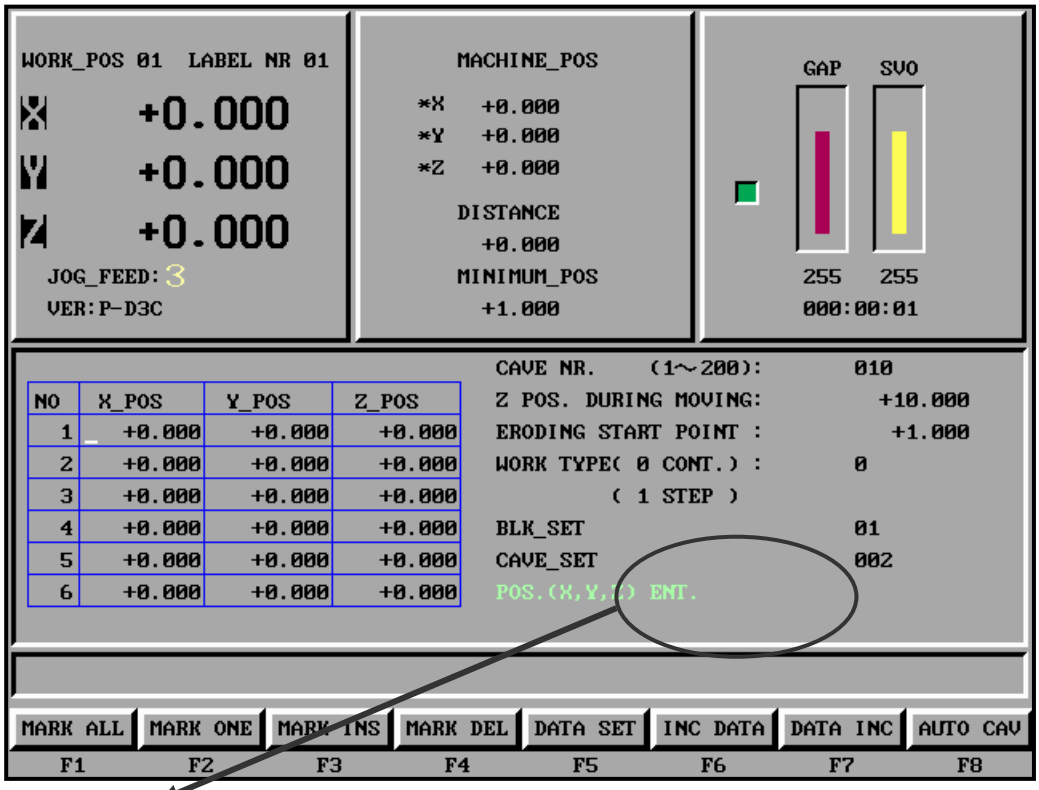
5、Press F8 for fixed pattern POS. editing.

6、The multi-cavity sparking is available on different planes as follows:



PATTERN

PNC F4 PATTERN MODE :



Pattern POS. editing：

Cursor moved to "POS.(X,Y,Z) ENT", the pattern POS. table will appear. F1-F8 for functions：

Paging any NO. of table, editing random data or editing with any functionsF1-F8.

1、 MARK ALL：Selecting whole table for POS. editing.

2、 MARK ONE：Selecting the chosen cavity NO.(cursor POS.) for POS. editing.

3、 MARK INS：Inserting one POS. as the chosen cavity NO.(cursor POS.) before it.

4、 MARK DEL：Deleting the chosen cavity NO.(cursor POS.).

5、 DATA SET：Entering new POS. to marked data.

6、 INC DATA：Adding the same data to all marked original data.

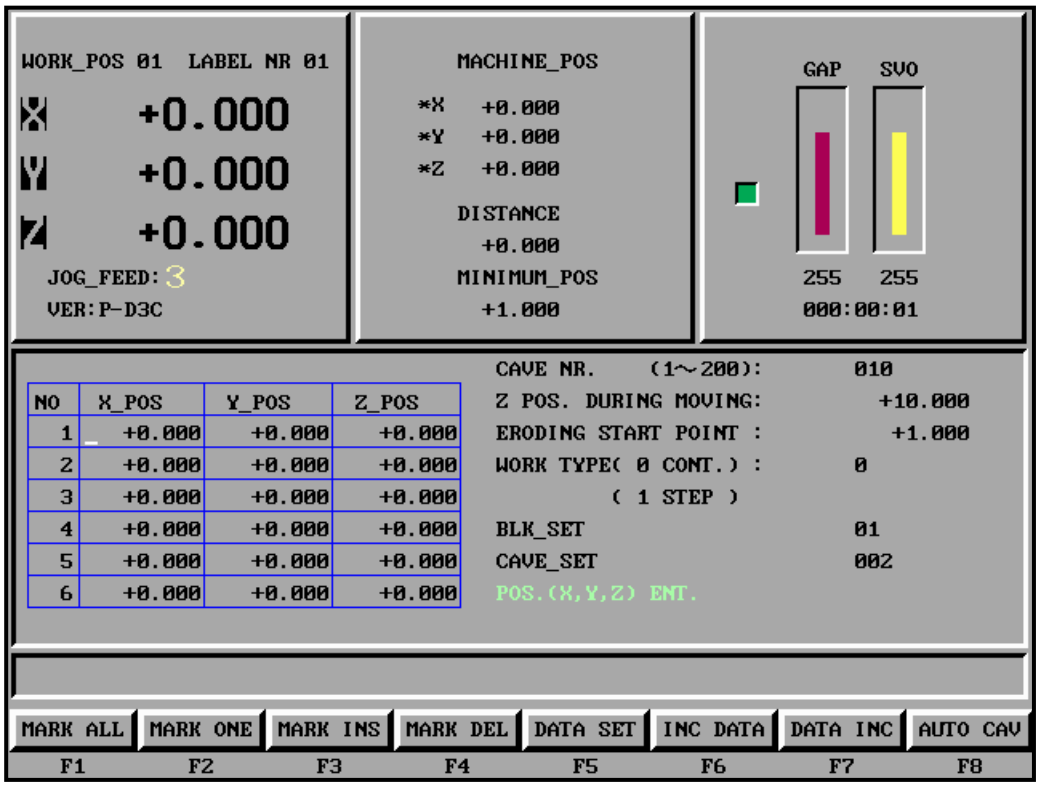
7、 DATA INC：Adding incremental to all marked data one by one. (The 1st marked one no change)

8、 AUTO CAV：Fixed pattern POS. editing.

***** Moving the cursor to the wanted start cavity NO. Press F8 for fixed pattern POS. editing.**

PATTERN

PNC F4 PATTERN MODE :



PATTERN with AUTO_CAV (fixed pattern cycle) :

1、 Cursor moved to "POS.(X,Y,Z) ENT", the pattern POS. table appeared with cursor.

2、 Moving cursor to wanted 1st cavity NO. of wanted pattern block. (Could be not the 1st cavity of POS. table)

3、 Press F8 (AUTO CAV) for fixed pattern cycle editing.

4、 Selecting wanted pattern cycle.

5、 Following the dialogue to edit the POS. Distance, Cavity No. etc.

6、 Press ENT ; All the new calculated POS. data will be generated into the table.

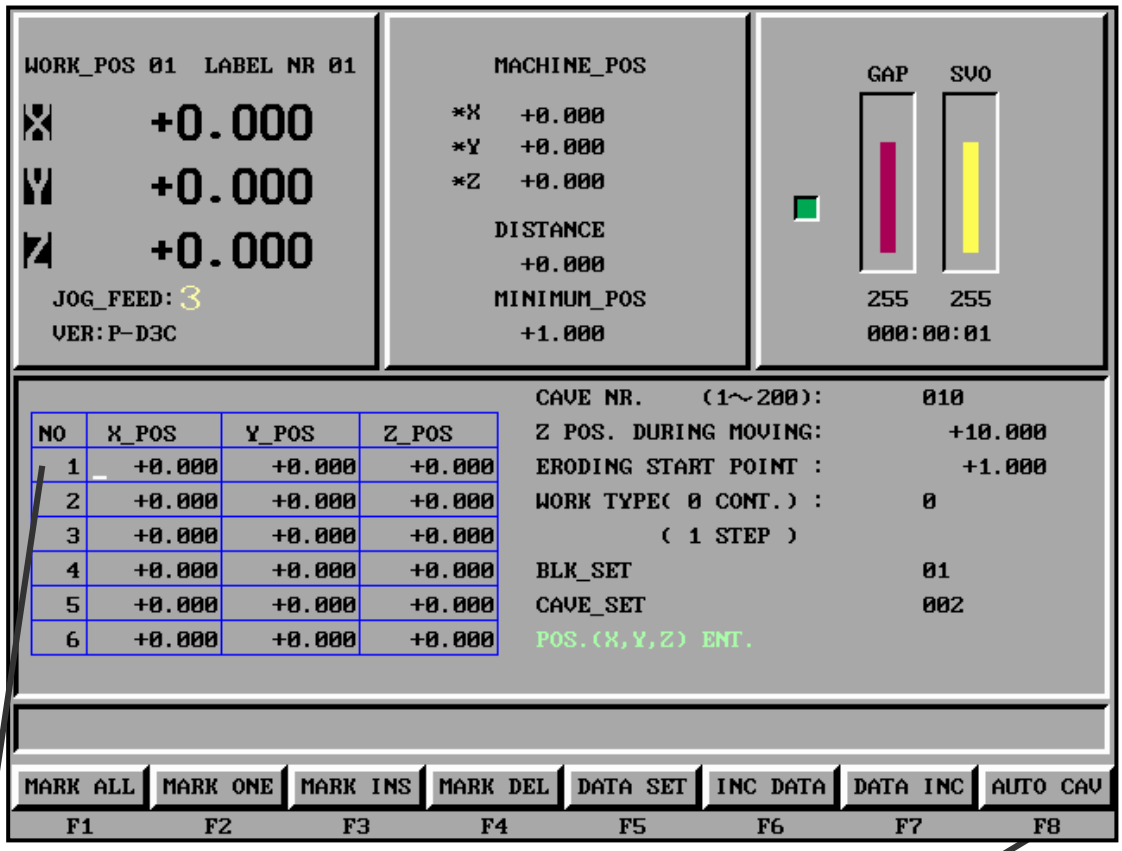
7、 Moving the cursor to the next wanted 1st cavity No. of next wanted pattern block.

8、 Repeating the same procedures 3 – 6 .

9、 Ensuring the programmed cavities POS.、NR.、Z POS. …are correct, press ▲ to finish pattern editing.

Press F5 to run the pattern sparking.

PNC F4 → PATTERN → POS.(X.Y.Z.) ENT. :



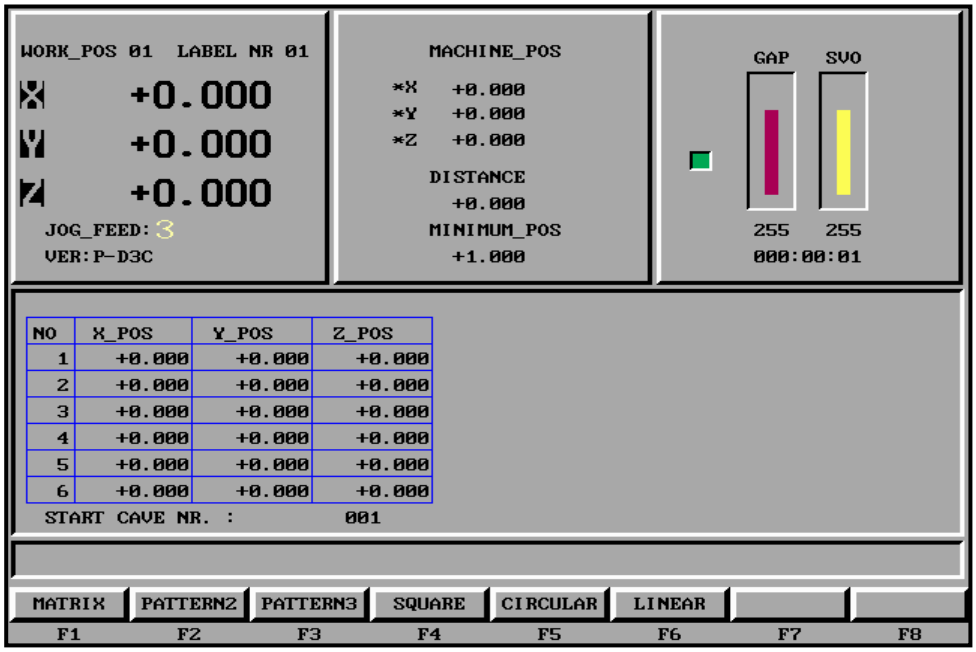
1、Moving the cursor to No. 1

2、Press F8 (AUTO CAV), for fixed pattern cycle editing：

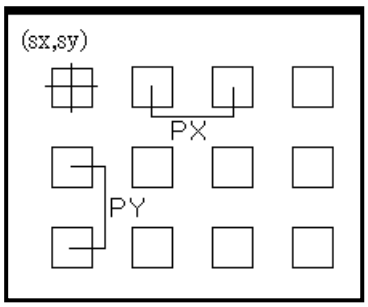
3 *Caution*：The cursor No. is the start cav No.

4、Multi blocks of fixed pattern cycles can be edited and executed

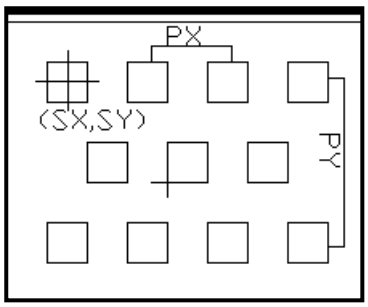
PNC F4 PATTERN MODE :



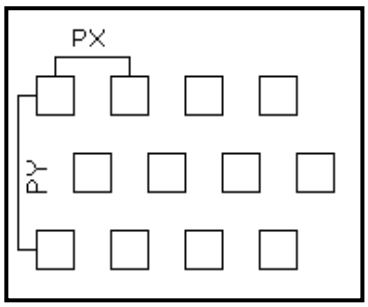
PNC F4 PATTERN→POS.(X.Y.Z.) ENT. → F8 AUTO_CAV :



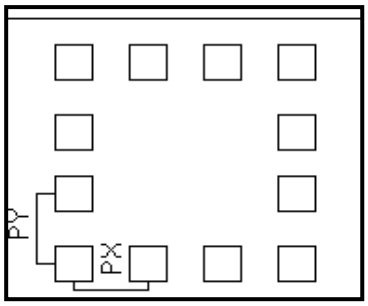
F1 MATRIX



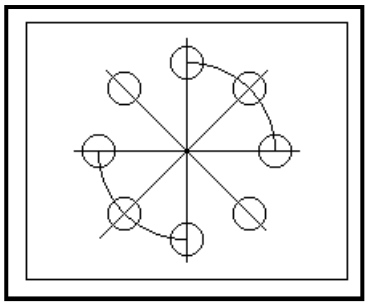
F 2 PATTERN2



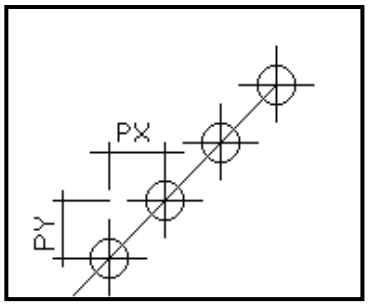
F 3 PATTERN3



F 4 SQUARE



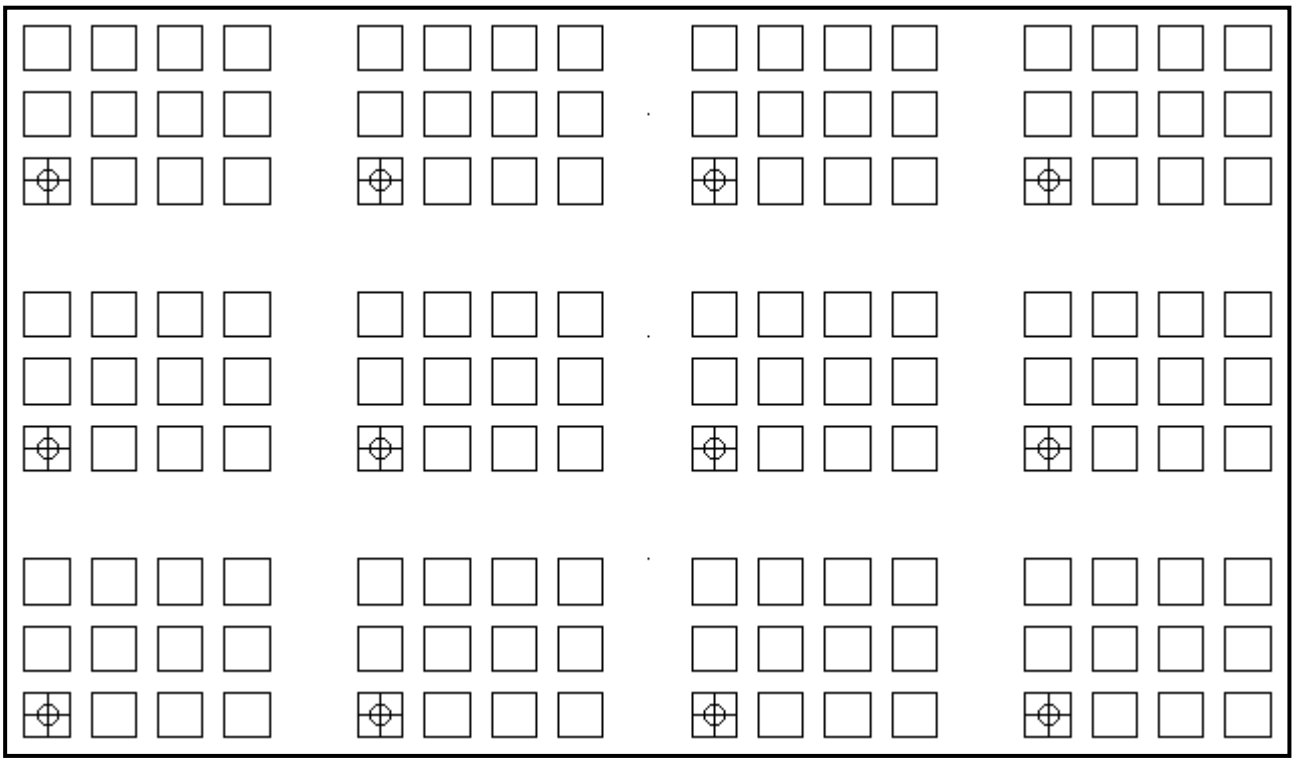
F5 CIRCULAR

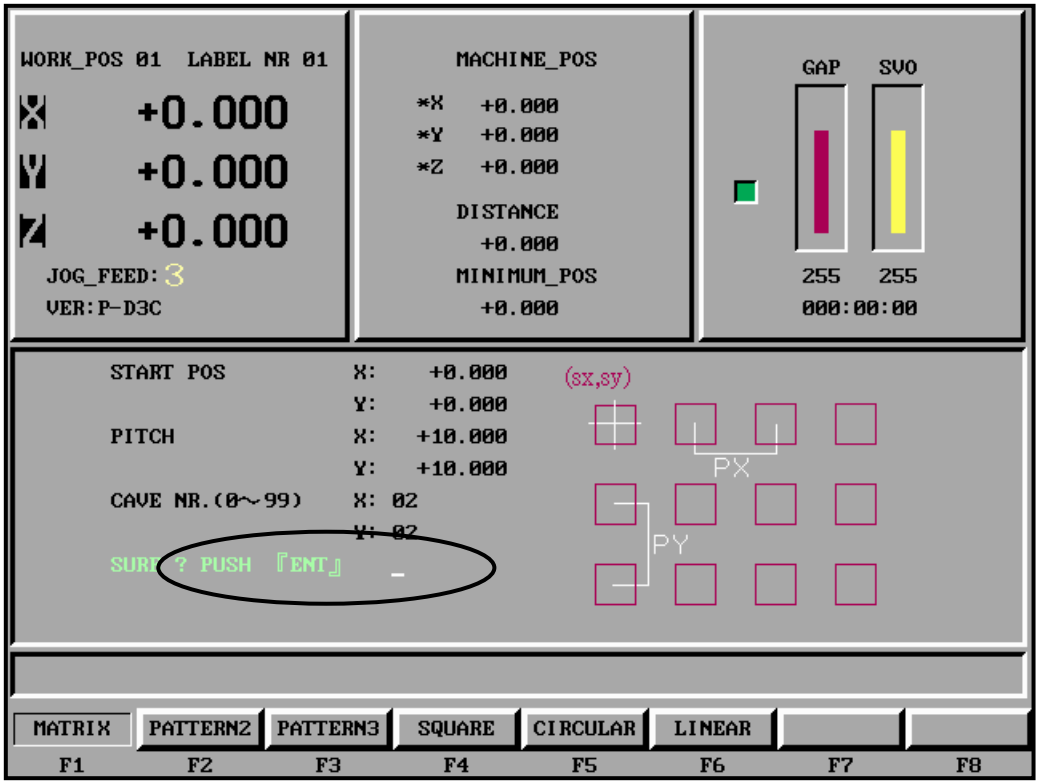


F6 LINEAR

.

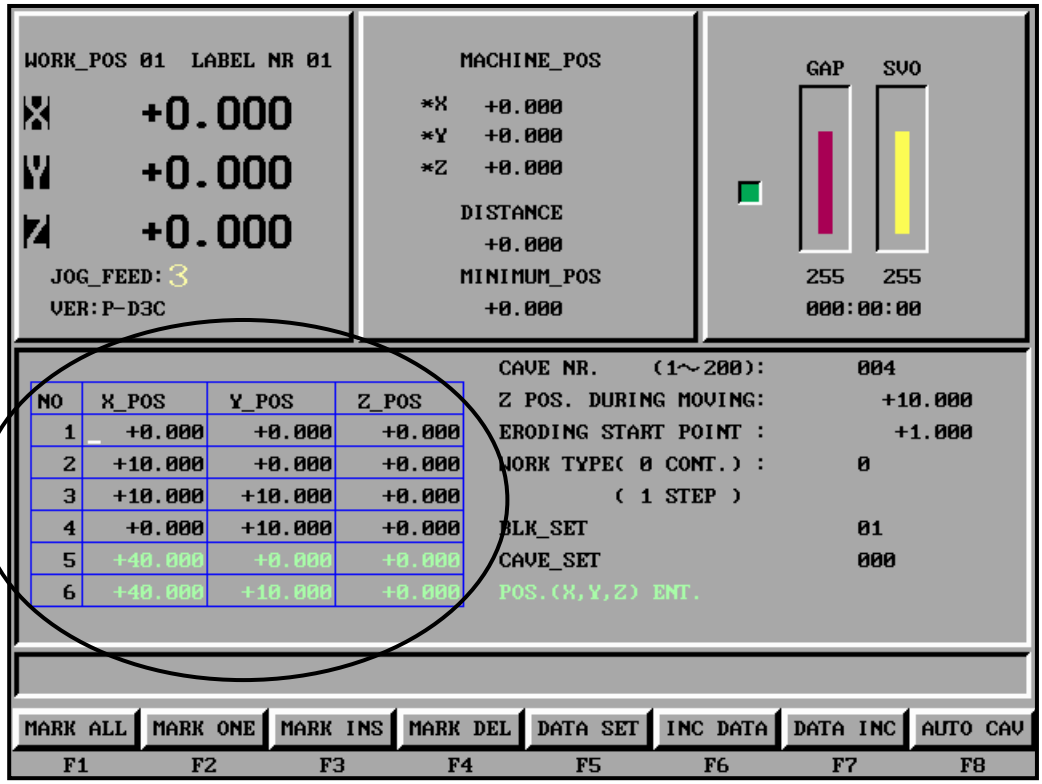
Multi Blocks of AUTO_CAV editing :



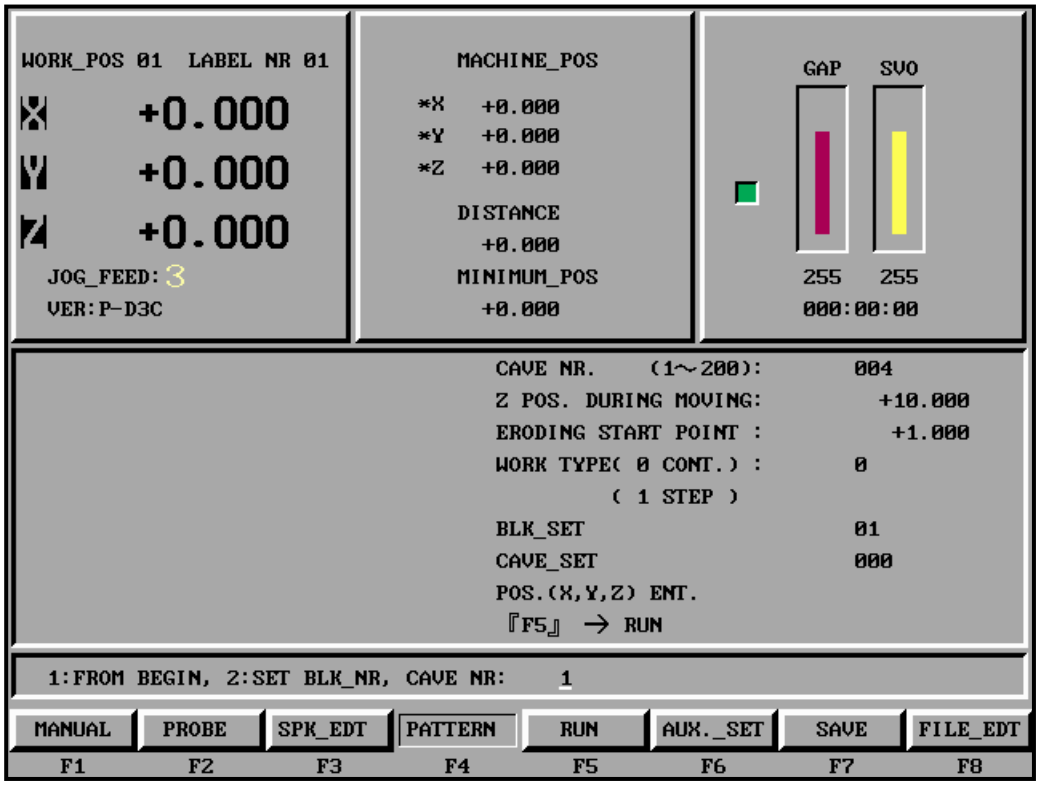


1、 Following the dialogue, Referring to the drawing to edit the pattern data.

2、 Press ENT：then back to the pattern table display automatically. The calculated new POS. data will be inserted into the table like following,

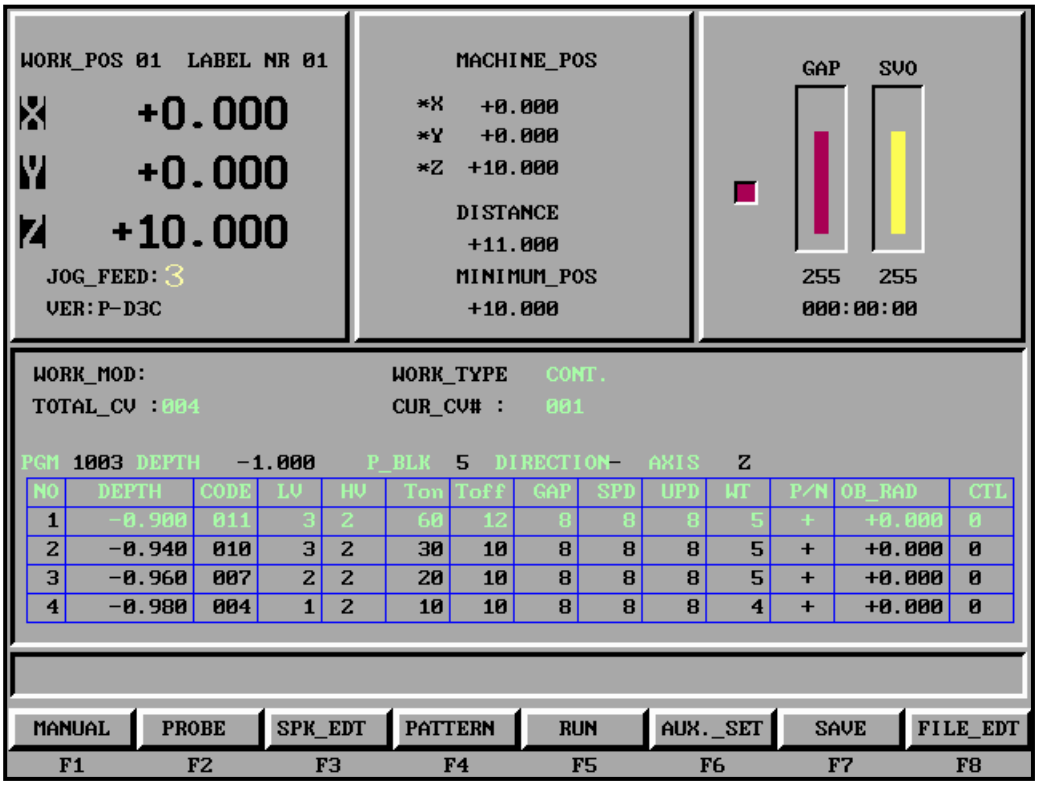


To Finish pattern editing, press ▲ out of the pattern POS. table display, Rechecking the CAVE NR., Z POS. DURING MOVING, ERODING START POINT, WORK TYPE, BLK_SET, CAVE_SET,
Press F5 to RUN the pattern machining：



Press F5 , Dialogue shows：
“ 1：FROM BEGINING, 2：SET BLK_NR,CAVE_NR：1”
1、 Press "1 + ENT" to spark from cavity NO. 1 of pattern table.
2、 Press "2 + ENT" to select BLK_NR. and CAVE NR. for sparking.

Display of pattern machining:

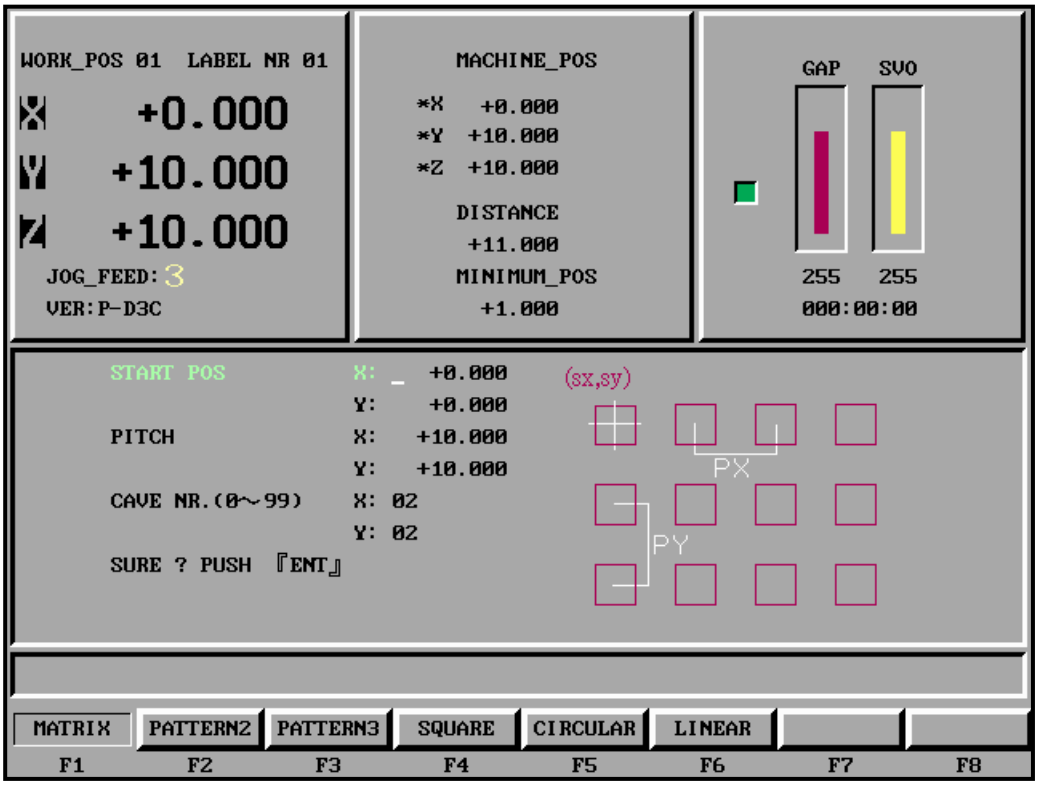


1、 **PNC pattern machining can be interrupted by pressing STOP on the remote control box temporary。Pressing ESC for sparking OFF。**

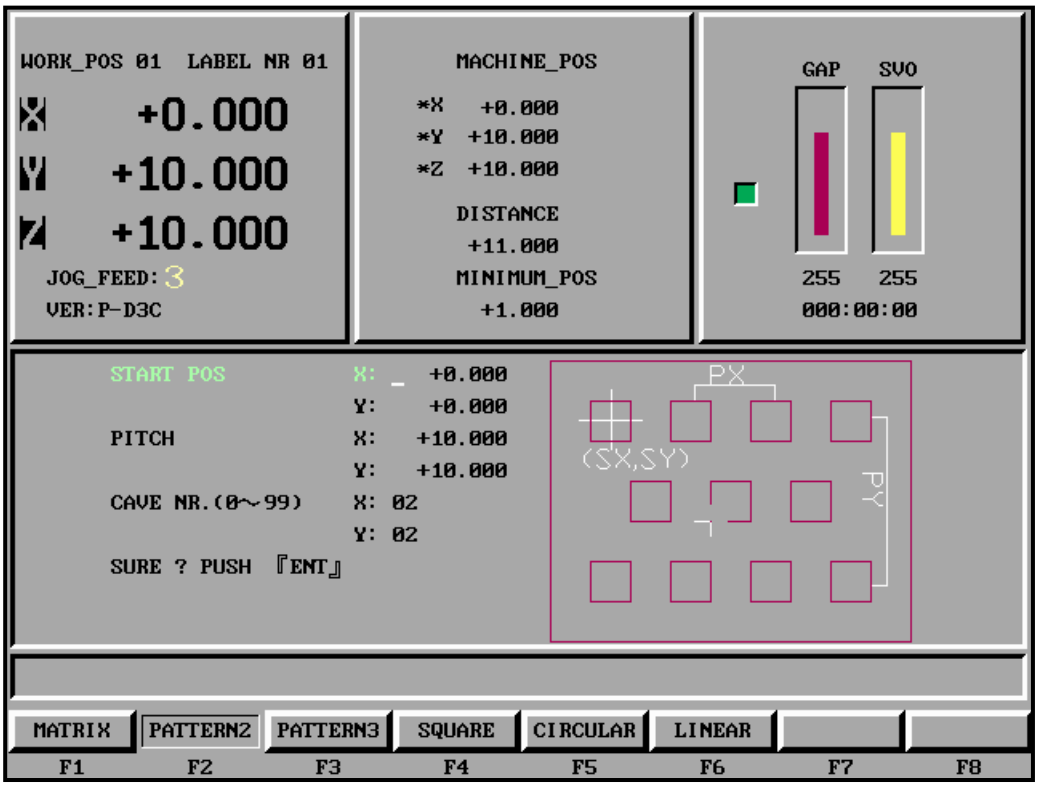
2、 **During interruption, Z-axis can be moved up/down, X & Y can be moved away for intermediate check of sparking。**

3、 **Press START of remote control box, X & Y axes will be moved back to interrupted position firstly, then Z down to resume sparking。**

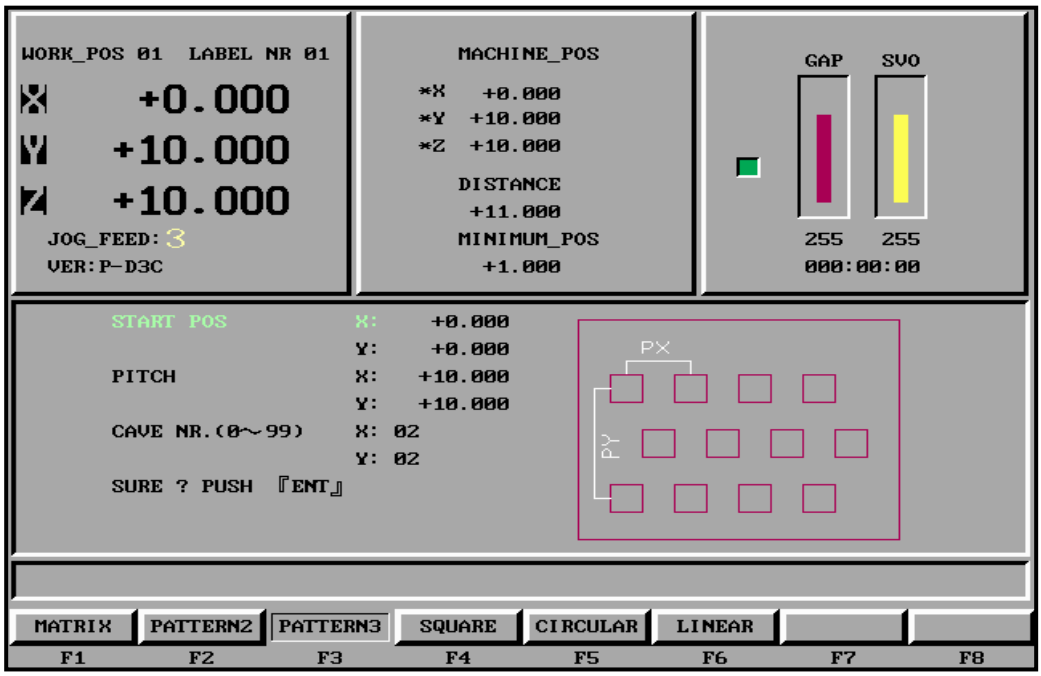
PNC F4 PATTERN→POS.(X.Y.Z.) ENT. → F8 AUTO_CAV(F1 MATRIX :



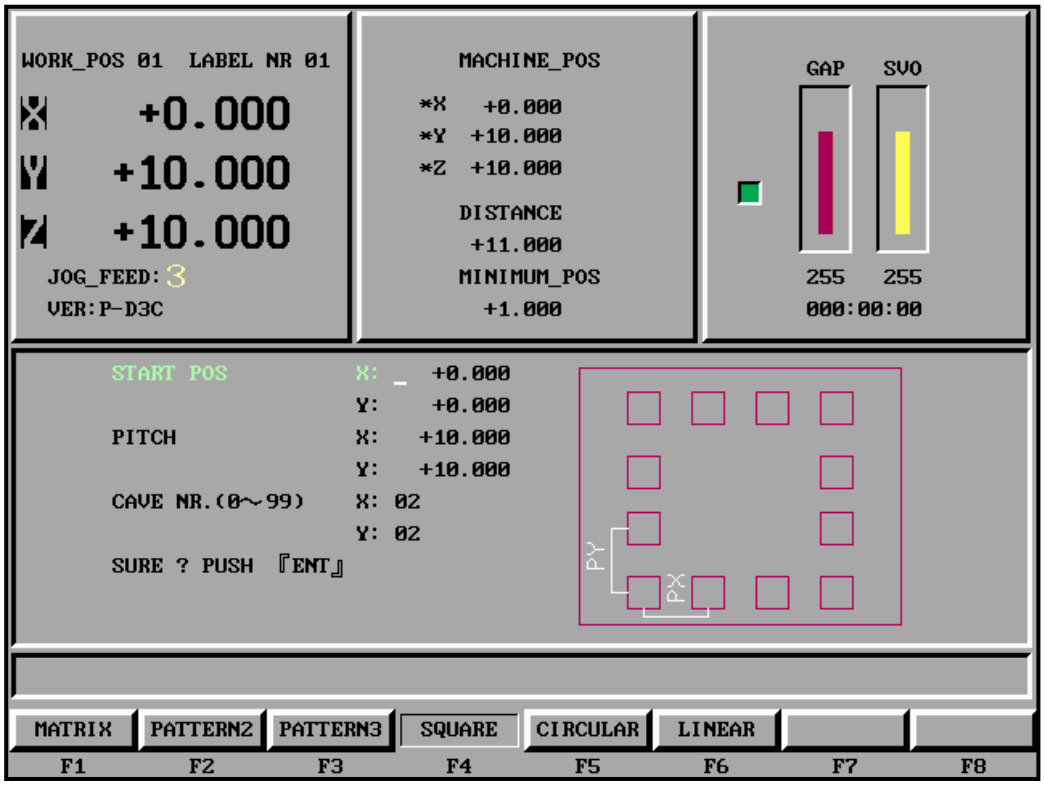
PNC F4 PATTERN→POS.(X.Y.Z.) ENT.→ F8 AUTO_CAV(F2 PATTERN2:



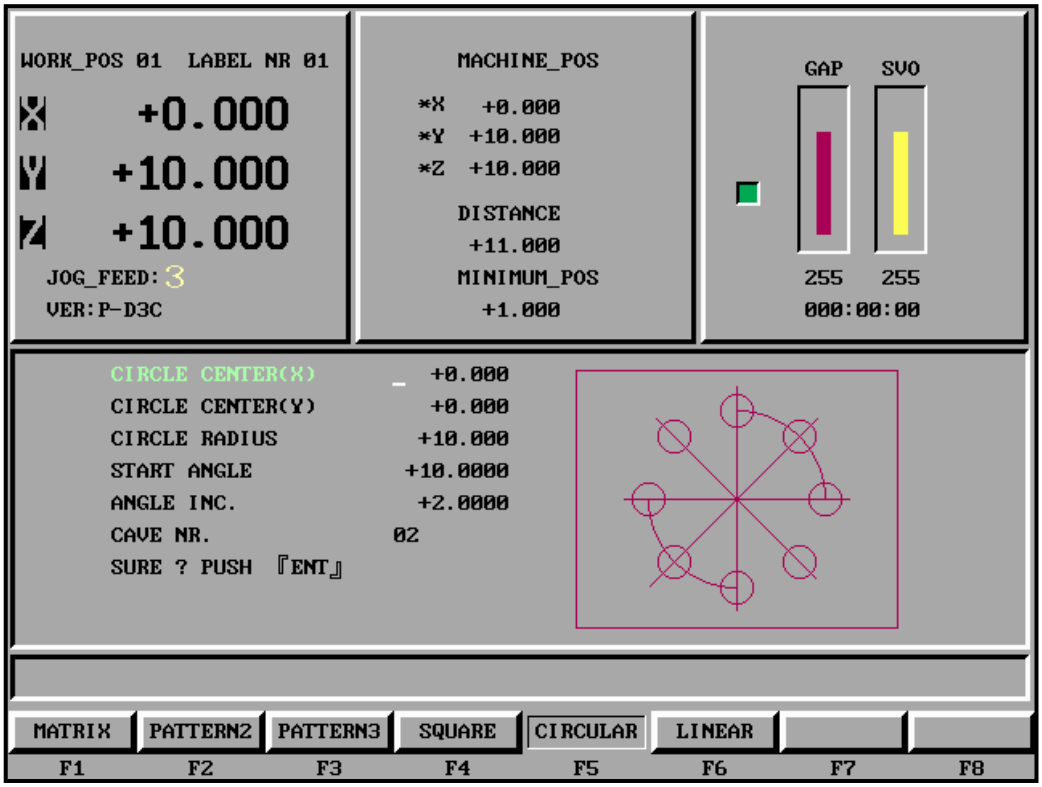
PNC F4 PATTERN→POS.(X.Y.Z.) ENT. → F8 AUTO_CAV→F3 PATTERN3:



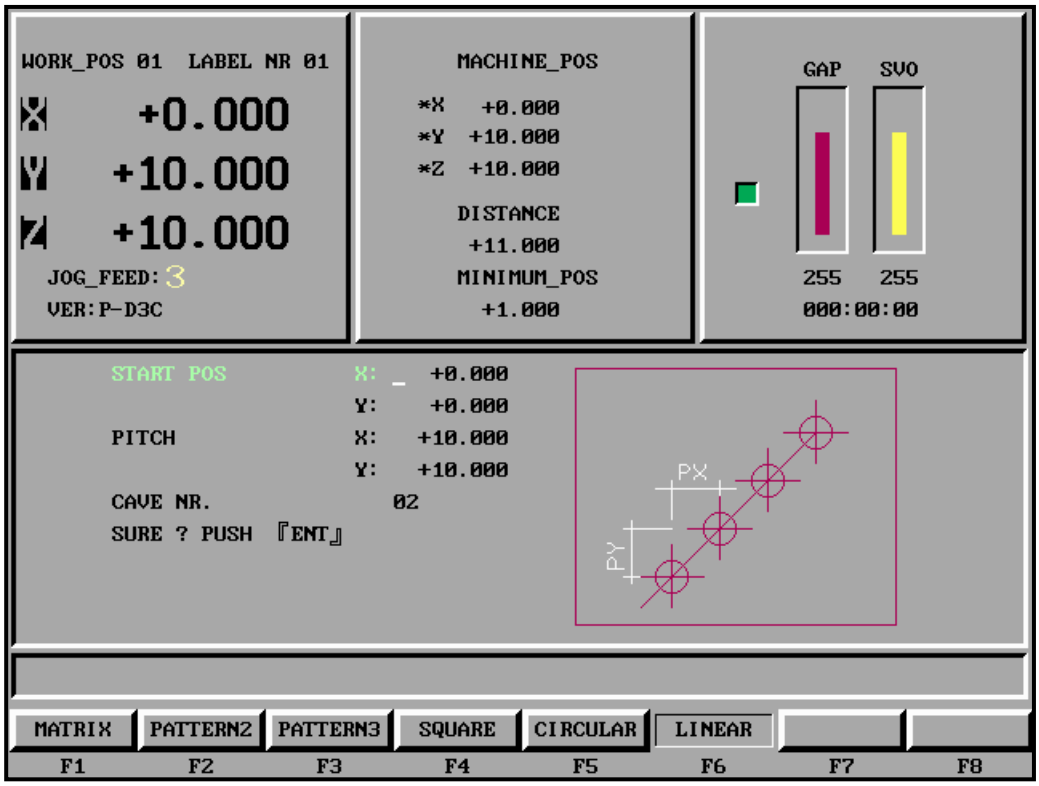
PNC F4 PATTERN→POS.(X.Y.Z.) ENT. →F8 AUTO_CAV→F4 SQUARE :



PNC F4 PATTERN→POS.(X.Y.Z.) ENT. → F8 AUTO_CAV→F5 CIRCULAR :

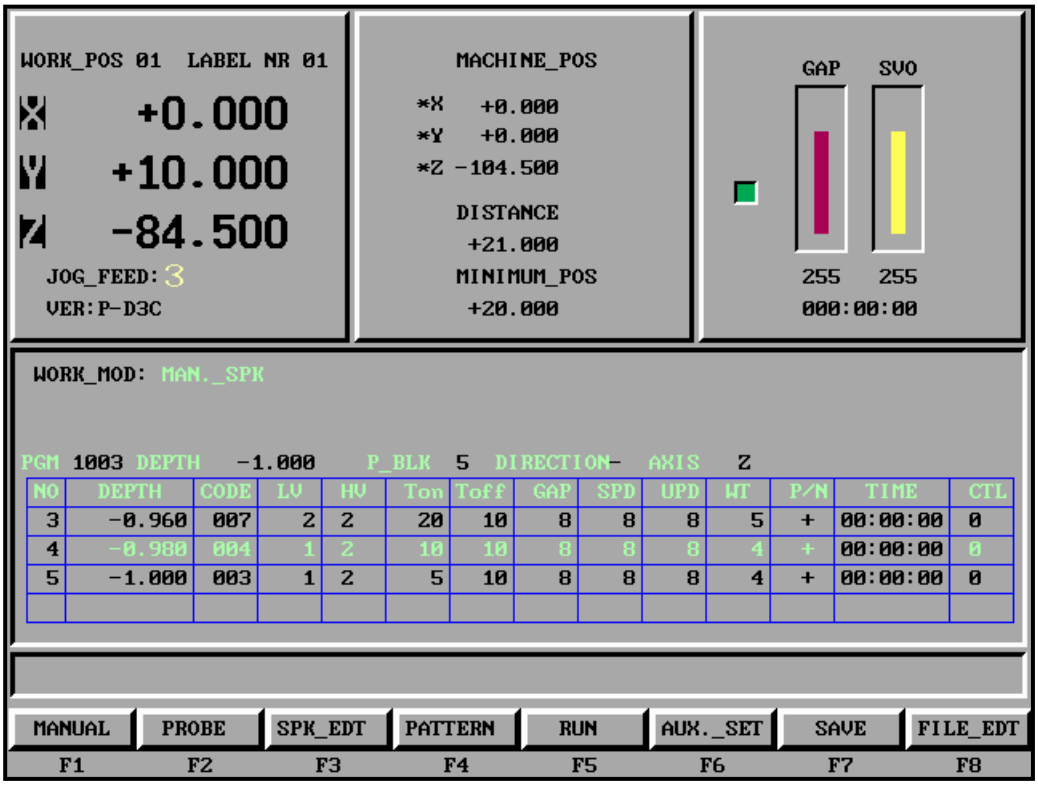


PNC F4 PATTERN→POS.(X.Y.Z.) ENT. → F8 AUTO_CAV→F6 LINEAR :



Operating procedure:

1. **Editing program : Depth, Sparking Code, AUX. Function .**
2. **Editing Pattern for multi-Cavities machining with PNC.**
3. **Pattern Program executed.**



1、 After electrode and work piece are aligned, sparking program edited. Press F5 for single cavity sparking.

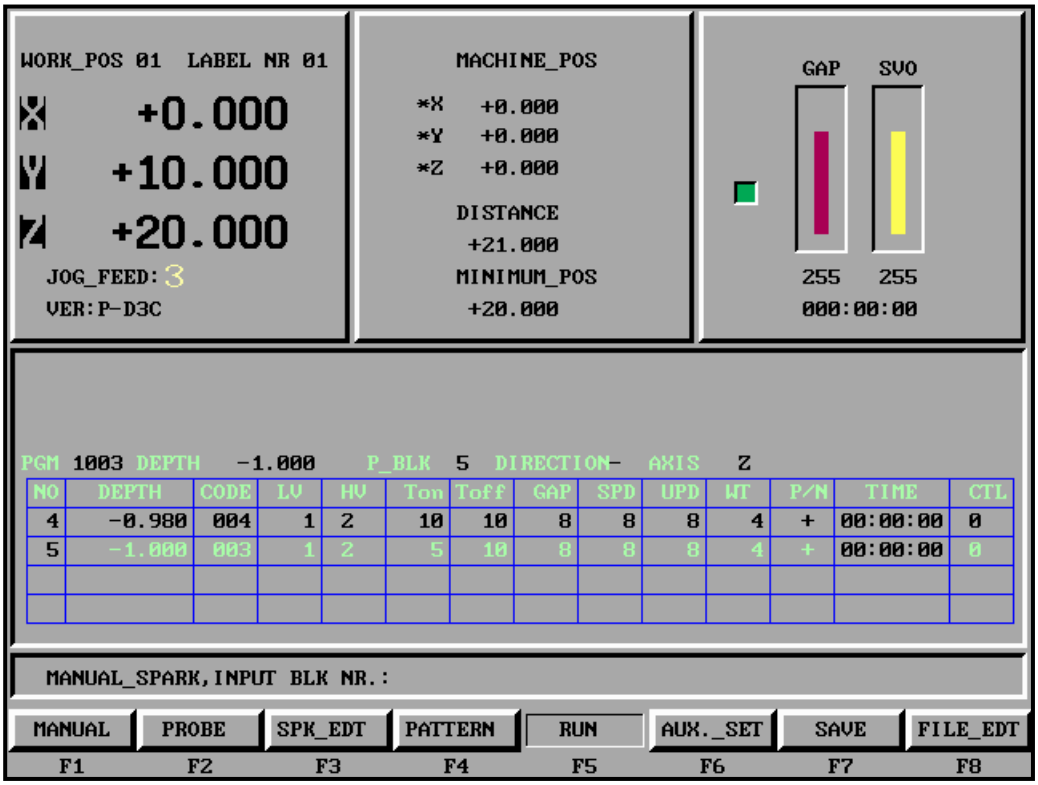
2、 During sparking, when security system finds something wrong, sparking will be turned OFF automatically. Only when the fault is cleared, press ENT to erase the error status(latch), then press START to resume sparking.

3、For PNC, intermediate stop by pressing STOP , then ESC for sparking off.

4、For ZNC, only need to press STOP for sparking off.

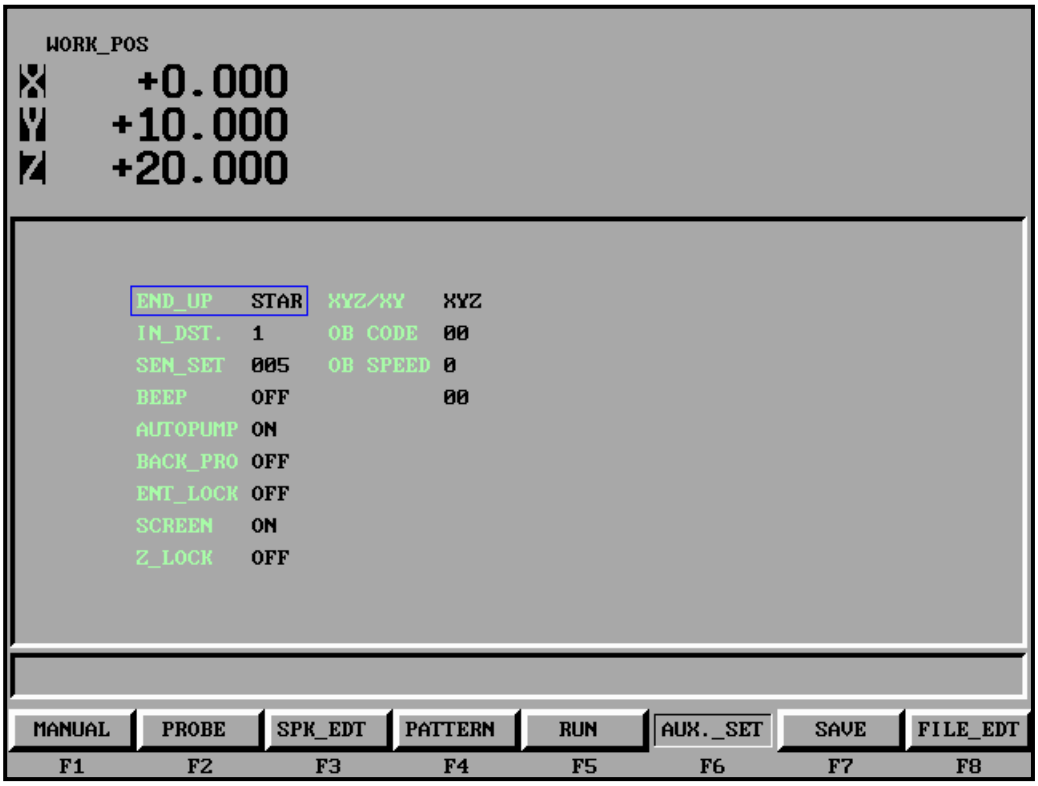
5、START of Remote Control Box for sparking ON & Resume working.

- Single Cavity sparking can be started from any Block No.



AUXiliary sparking function SETting

● *Contents of each AUX edited by pressing* [←-] 、[+→] *set to toggle switch.*



END_UP： Z UP or not after program END.
- **MAX ：** Up to Limit Switch.
- **STAR ：** Up to STARt position of program.
- **NO ：** NO Z Up

IN_DST. ： DIStance to MIN._POS of sparking job for slow down. Range 5steps.

SEN_SET： SENsitivity of retracting. Range 0 – 255.
Larger SEN_SET, more sensitive to retract for debris removal, slower machining.
Smaller SEN_SET, less sensitive to retract for debris removal, better machining.

BEEP： Buzzer off delay ON / OFF control.
System activates alarm buzzer after PGM_END or malfunction encountered to alert operator.
- **ON ：** Beeps until any key on panel be pressed.
- **OFF：** Beeps for 5 second only.

AUTOPUMP： Dielectric PUMP AUTOmatically ON with Sparking ON.
- **ON ：** PUMP ON with Sparking ON.
- **OFF：** PUMP NOT ON with Sparking ON.

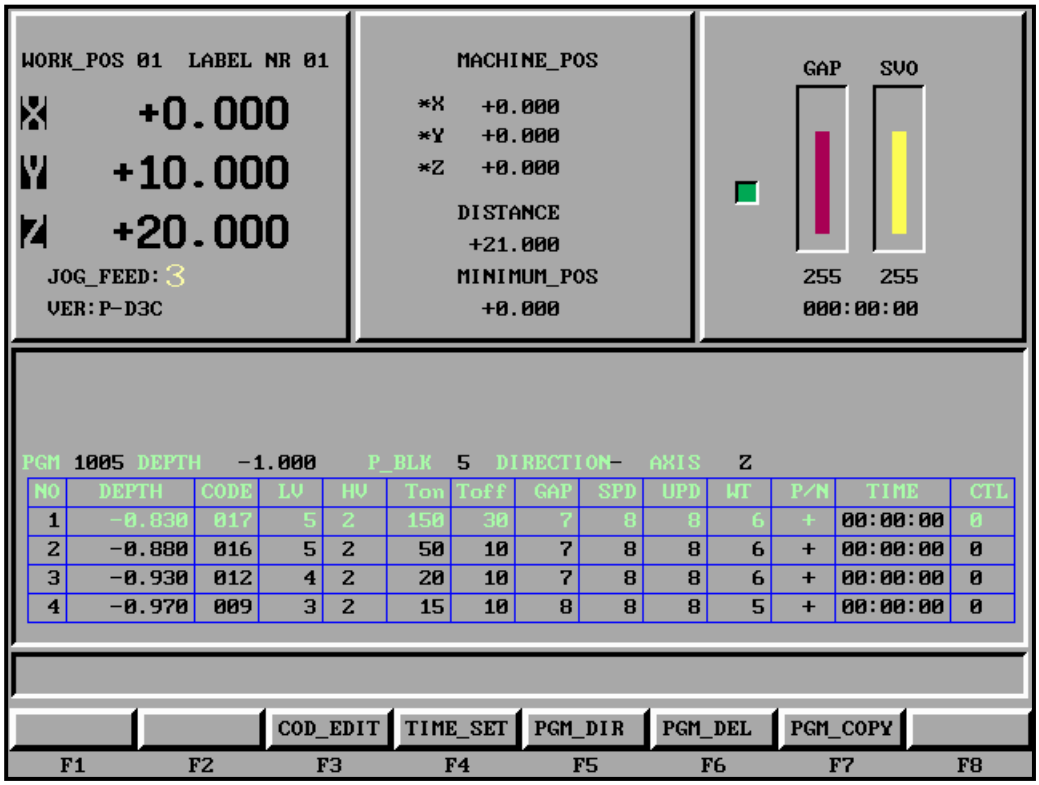
BACK_PRO： BACK PROtection function activated when arcing occurs due to poor debris removal, sparking is turned off to prevent electrode and work piece damage.
- **ON ：** BACK_PRO activated.
- **OFF：** BACK_PRO not activated.

ENT_LOCK: **ENTry LOCKed or not during sparking.**
ON: program editing not allowed during sparking.
OFF: program editing allowed during sparking.
SCREEN: **SCREEN protection mode ON/ OFF.**
ON: Activate Screen Protection mode, Screen background is black.
OFF: Screen Protection mode not activated.
Z_LOCK: **Z-Axis LOCK ON / OFF during sparking.**
ON : Z_LOCK for external Orbit Head application.
OFF: No Z_LOCK.
ZXYZ/XY: **For OBCUT option: Working Plane**
OB CODE: **For OBCUT option: Working Code**
OB SPEED: **For OBCUT option: Working Speed**
MATERIAL: **For Future Use**
ROTARY_T: **For Rotary Indexer option**
ON : Signals to & from Rotary Indexer.
OFF: Normal PNC Operation.

F7 Save Mode

Save the current machining data into buffer memory before power turned off

Sparking FILE EdiTing Mode



"F3" COD_EDIT : CODes EDITing / Eroding Table Editing

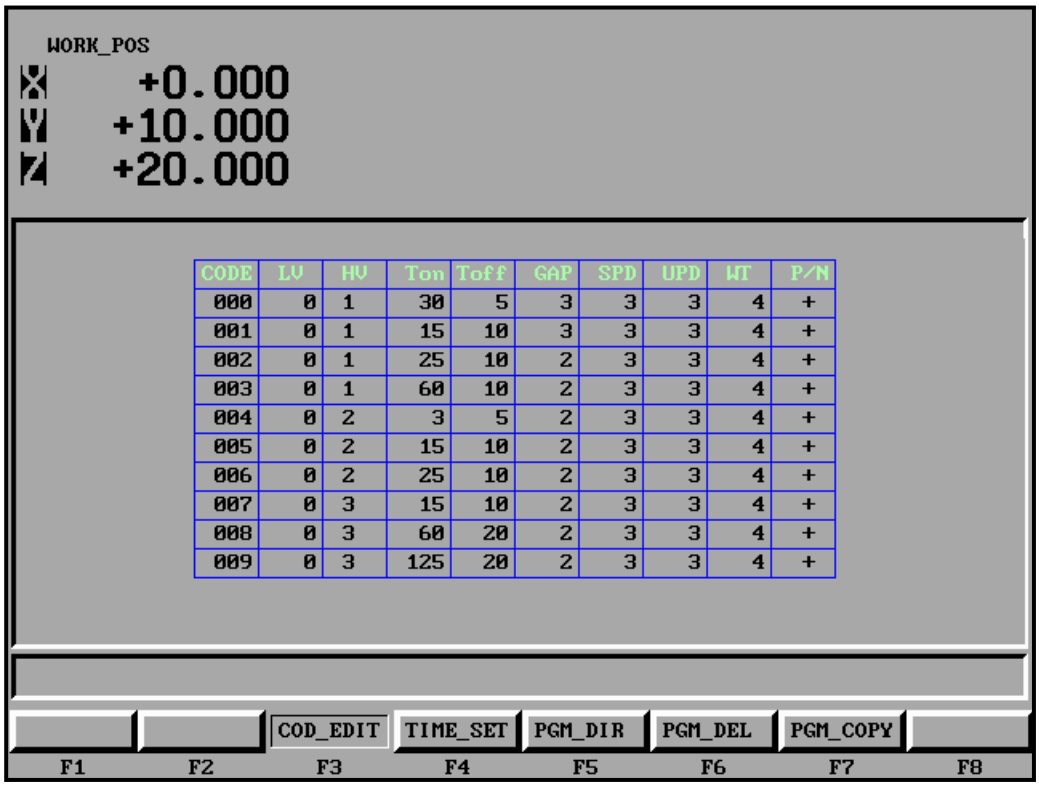
"F4" TIME_SET : TIME control enable & SET timer

"F5" PGM_DIR : ProGraM DIRectory

"F6" PGM_DEL : ProGraM DELete

"F7" PGM_COPY : ProGraM COPY

"F3" : CODes EDITing / Eroding Table Editing



CODE	LV	HV	Ton	Toff	GAP	SPD	UPD	WT	P/N
000	0	1	30	5	3	3	3	4	+
001	0	1	15	10	3	3	3	4	+
002	0	1	25	10	2	3	3	4	+
003	0	1	60	10	2	3	3	4	+
004	0	2	3	5	2	3	3	4	+
005	0	2	15	10	2	3	3	4	+
006	0	2	25	10	2	3	3	4	+
007	0	3	15	10	2	3	3	4	+
008	0	3	60	20	2	3	3	4	+
009	0	3	125	20	2	3	3	4	+

We offer an Eroding Table Data Base for your reference to choose for working. You can optimize its contents or setup your own combination be a new code for your specific application. We suggest you divide the codes into groups according to material & LV for easier recall.

CODE **No. range 001- 499 , according to material:**

001 ～ 199 Copper Electrode — Steel
200 ～ 299 Graphite Electrode — Steel
300 ～ 309 Steel Electrode — Steel
310 ～ 319 Copper Electrode — Tungsten
320 ～ 499 Reserved for Users

● ***Copper Electrode --- Steel:***

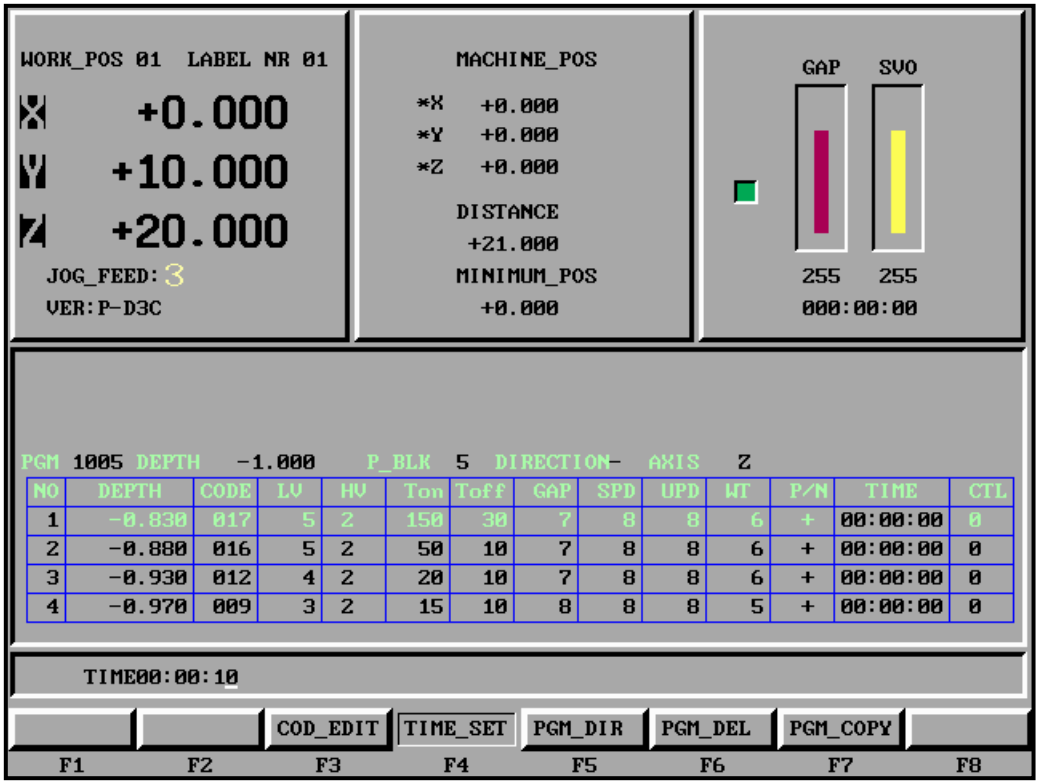
001 ～ 009 : 1 A ～ 3 A HV
010 ～ 109 : 1 A ～ 9 A LV
└── > 1st digit: bigger number, bigger gap, lower wear ratio, used for deeper machining
└──> Every 10 steps with same LV & different wear ratio
110 ～ 114 : 12 A LV with different wear ratio
└── > 1st digit: bigger number, bigger gap, lower wear ratio, used for deeper machining
└── > Every 5 steps with same LV, with different wear ratio
115 ～ 119 : 15A LV with different wear ratio
120 ～ 124 : 20A LV with different wear ratio
125 ～ 129 : 25A LV with different wear ratio
130 ～ 134 : 30A LV with different wear ratio
135 ～ 139 : 35A LV with different wear ratio
140 ～ 144 : 40A LV with different wear ratio
145 ～ 149 : 45A LV with different wear ratio
150 ～ 154 : 50A LV with different wear ratio
155 ～ 159 : 55A LV with different wear ratio
160 ～ 164 : 60A LV with different wear ratio
165 ～ 199 : Reserved

● ***Graphite Electrode --- Steel:***

200 ～ 209 : LV 1A ～ 9A
210 ～ 214 : 10A LV with different wear ratio
215 ～ 219 : 15A LV with different wear ratio
220 ～ 224 : 20A LV with different wear ratio
225 ～ 229 : 25A LV with different wear ratio
230 ～ 234 : 30A LV with different wear ratio
235 ～ 239 : 35A LV with different wear ratio
240 ～ 244 : 40A LV with different wear ratio
245 ～ 249 : 45A LV with different wear ratio
250 ～ 254 : 50A LV with different wear ratio
255 ～ 259 : 55A LV with different wear ratio
260 ～ 264 : 60A LV with different wear ratio
265 ～ 299 : Reserved

● ***Steel Electrode --- Steel:***

300 : 5 A LV
301 : 10 A LV
302 : 20 A LV
303 : 30 A LV
304 : 40 A LV
305 : 50 A LV
306 : 60 A LV
307 ~ 309 : Reserved



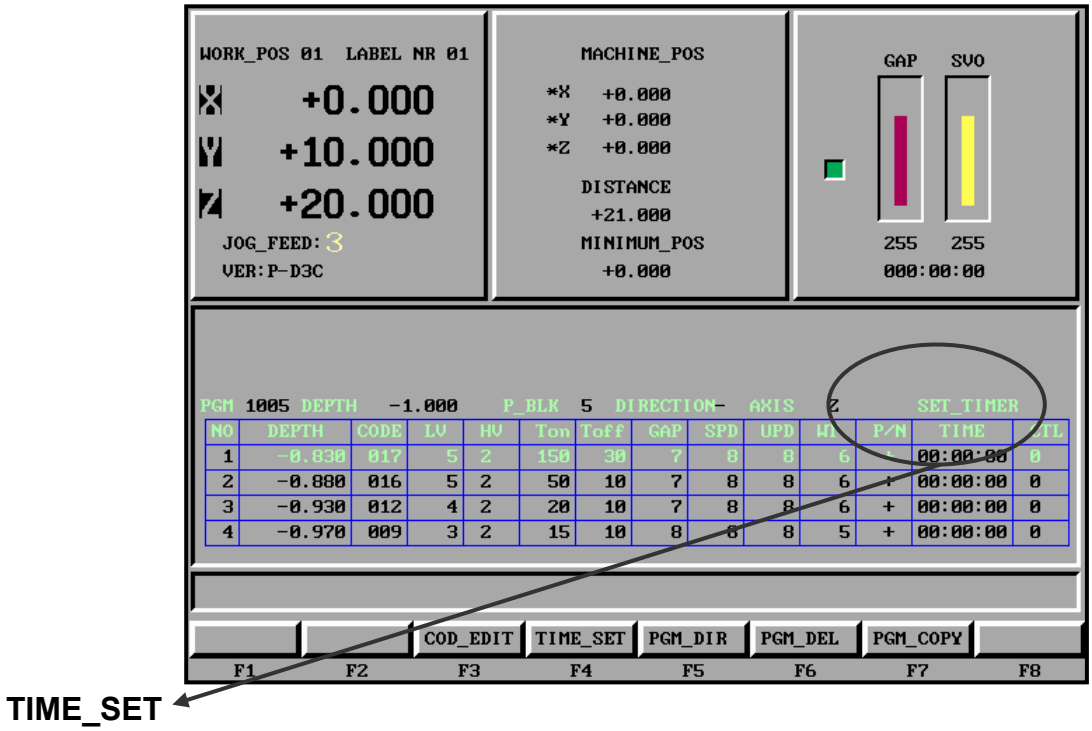
"F4" : TIME control enable & SET timer

● In addition to Depth control, we also can enable the "TIME_CONTROL" to finish the machining.

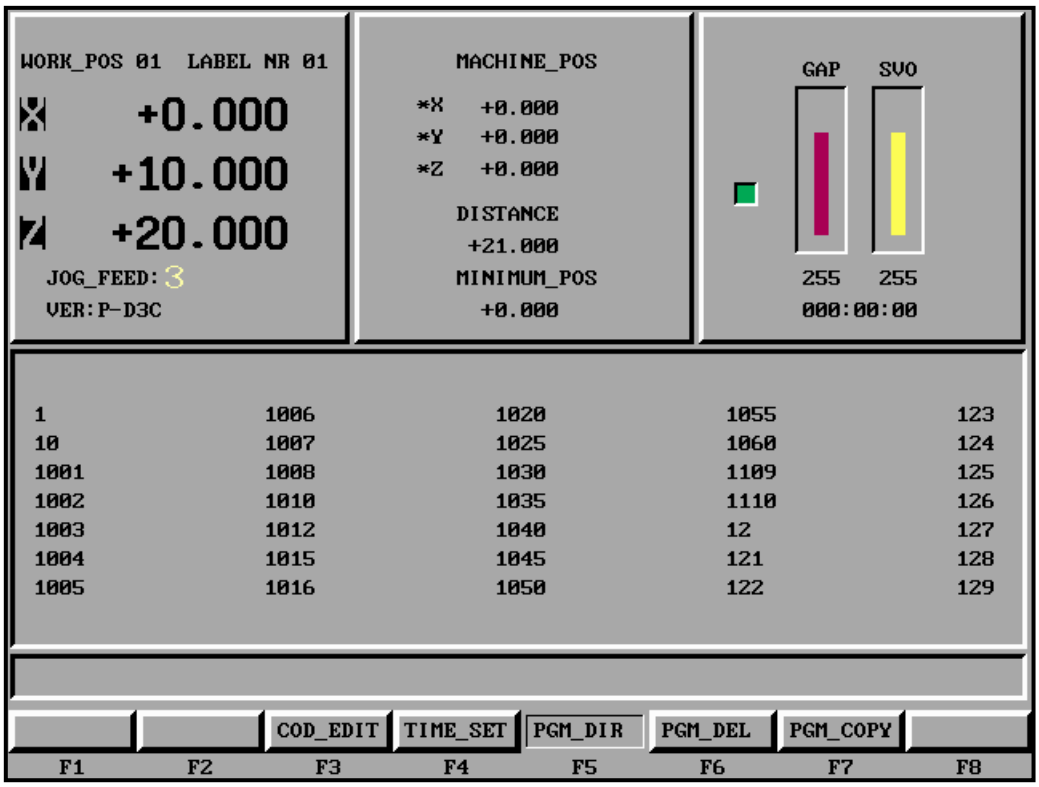
1.SET_TIMER shown above programming table, at right side, when TIME_CTL enabled.

2. When the last block of program be executed, program completed due to Depth reached or Set Timer runs out, dependant on which one comes first.

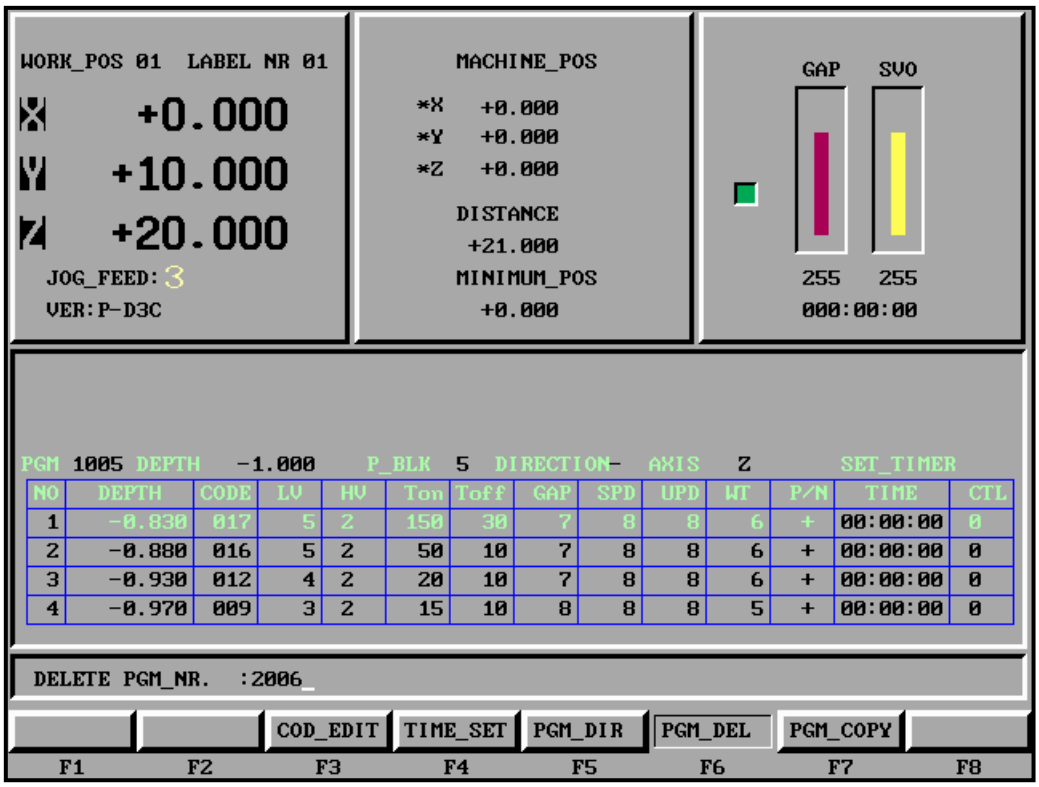
3. Then, Z Up or not according to END_UP of AUX._SET to finish sparking program.



“F5” : ProGraM DIRectory



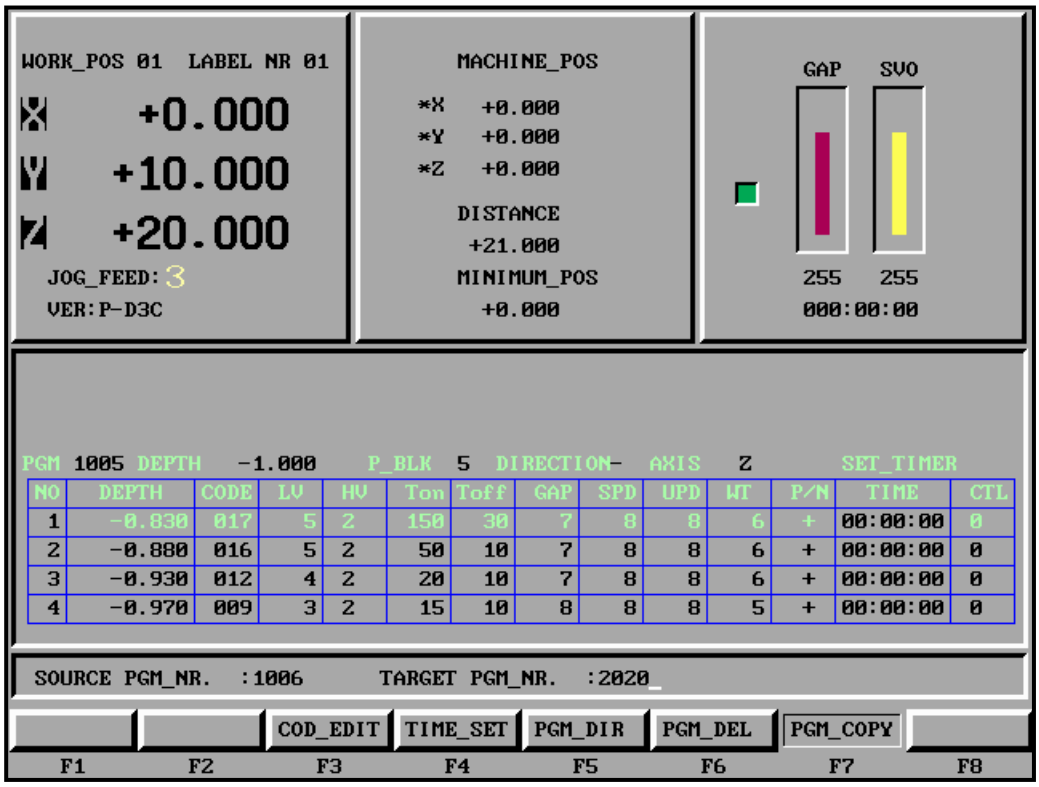
"F6" : ProGraM DELete



DELETE PGM_NR: **key in PGM_NR,** ENT

F8 → FILE_EDT → F7 PGM_COPY

"F7" : ProGraM COPY



- **Copy from an existing source program to a new target program.**

SOURCE PGM_NR : **; Key in Source PGM Nr, then "ENT"**

TARGET PGM_NR : **; Key in Target PGM Nr, then "ENT"**

III

PC- ased EDM System

Program Table

(Sparking)

LV A	HV A	Ton μs	Toff μs	GAP V V	VDI	ROUGHNESS μmRa	TWO GAP 2xGAP(mm)	WEAR RATIO %	SPEED mm3/min
0	1	2	5	45	15	0.4	0.02	15	0.2
0	1	5	5	45	17	0.7	0.02	10	0.6
0	1	10	5	45	19	0.9	0.04	6	0.9
0	1	20	10	45	20	1.0	0.06	4	1.3
0	1	40	10	45	22	1.26	0.07	1.8	1.6
0	1	80	10	45	23	1.6	0.09	0.9	1.8
0	1	100	15	45	24	1.8	0.10	0.6	1.2
0	1	125	15	45	25	2.1	0.11	0.4	0.8

LV A	HV A	Ton μs	Toff μs	GAP V V	VDI	ROUGHNESS μmRa	TWO GAP 2xGAP(mm)	WEAR RATIO %	SPEED mm3/min
0	2	2	5	45	18	0.8	0.02	20	0.4
0	2	5	5	45	19	0.9	0.03	18	0.8
0	2	10	5	45	22	1.26	0.06	10	2.1
0	2	20	10	45	23	1.4	0.07	8	2.5
0	2	40	10	45	24	1.6	0.08	5	3.0
0	2	80	10	45	26	2.0	0.10	2	2.0
0	2	100	15	45	27	2.2	0.11	1.5	1.5
0	2	125	15	45	28	2.5	0.12	0.8	1.2

LV A	HV A	Ton μs	Toff μs	GAP V V	VDI	ROUGHNESS μmRa	TWO GAP 2xGAP(mm)	WEAR RATIO %	SPEED mm3/min
0	3	2	5	45	19	0.9	0.02	24	0.5
0	3	5	5	45	20	1.1	0.04	21	0.9
0	3	10	10	45	22	1.28	0.06	12	2.4
0	3	20	15	45	24	1.6	0.07	8.4	2.8
0	3	40	15	45	25	1.7	0.08	5.8	3.4
0	3	80	20	45	26	2.2	0.08	2.2	2.4
0	3	100	20	45	28	2.4	0.09	1.6	1.9
0	3	125	20	45	29	2.8	0.09	1.0	1.6

LV A	HV A	Ton μs	Toff μs	GAP V V	VDI	ROUGHNESS μmRa	TWO GAP 2xGAP(mm)	WEAR RATIO %	SPEED mm3/min
1	1	2	5	40	20	1.0	0.05	9.6	0.7
1	1	5	5	40	23	1.4	0.06	8	2.1
1	1	10	10	40	24	1.6	0.07	1.4	4.1
1	1	20	10	40	25	1.8	0.08	1	4.8
1	1	40	15	40	26	2.0	0.09	1.0	6.6
1	1	60	20	40	27	2.24	0.12	0.9	4.6
1	1	80	20	40	29	2.8	0.16	0.8	4.1
1	1	100	20	40	31	3.3	0.18	0.4	3.2

LV A	HV A	Ton μs	Toff μs	GAP V V	VDI	ROUGHNESS μmRa	TWO GAP 2xGAP(mm)	WEAR RATIO %	SPEED mm3/min
2	1	2	5	40	20	1.0	0.02	9.1	0.8
2	1	5	5	40	21	1.5	0.06	7.6	1.6
2	1	10	5	40	23	1.3	0.07	6.4	4.3
2	1	20	5	40	24	1.6	0.09	4.1	5.4
2	1	40	5	40	26	1.9	0.10	2.8	7.3
2	1	80	10	40	28	2.3	0.12	1.2	12
2	1	100	10	40	29	2.5	0.13	0.8	18
2	1	125	10	40	30	3.15	0.14	0.5	14

LV A	HV A	Ton μs	Toff μs	GAP V V	VDI	ROUGHNESS μmRa	TWO GAP 2xGAP(mm)	WEAR RATIO %	SPEED mm3/min
3	1	2	5	40	20	1.13	0.04	9.3	2
3	1	5	5	40	21	1.12	0.05	8.4	3
3	1	20	5	40	25	1.82	0.09	5.2	6
3	1	80	10	40	29	2.86	0.13	1.4	20
3	1	100	10	40	30	3.15	0.14	1.0	23
3	1	125	10	40	31	3.42	0.15	0.6	21

LV A	HV A	Ton μs	Toff μs	GAP V V	VDI	ROUGHNESS μmRa	TWO GAP 2xGAP(mm)	WEAR RATIO %	SPEED mm3/min
4	2	5	5	40	22	1.42	0.07	9.6	3
4	2	10	5	40	24	1.60	0.08	8.4	4
4	2	20	5	40	27	2.24	0.10	6.1	8
4	2	40	10	40	29	2.84	0.11	4.2	18
4	2	80	10	40	30	3.15	0.13	1.8	27
4	2	100	10	40	31	3.42	0.14	1.4	28
4	2	125	20	40	32	3.76	0.15	0.8	24
4	2	150	20	40	33	4.50	0.16	0.4	21

LV A	HV A	Ton μs	Toff μs	GAP V V	VDI	ROUGHNESS μmRa	TWO GAP 2xGAP(mm)	WEAR RATIO %	SPEED mm3/min
5	2	10	5	40	24	1.6	0.09	9.2	6
5	2	20	5	40	28	2.7	0.11	6.8	10
5	2	40	10	40	30	3.15	0.12	4.6	22
5	2	80	10	40	31	3.7	0.14	2.1	28
5	2	100	10	40	31	3.7	0.15	1.6	32
5	2	125	20	40	32	3.9	0.16	1.0	31
5	2	150	20	40	33	4.4	0.17	0.6	27
5	2	175	20	40	33	4.5	0.17	0.4	24

LV A	HV A	Ton μs	Toff μs	GAP V V	VDI	ROUGHNESS μmRa	TWO GAP 2xGAP(mm)	WEAR RATIO %	SPEED mm3/min
6	2	10	5	40	25	1.9	0.09	9.8	11
6	2	20	5	40	27	2.24	0.12	7.8	21
6	2	40	5	40	28	2.46	0.13	5.6	27
6	2	80	10	40	30	3.15	0.15	2.6	34
6	2	100	10	40	31	3.6	0.16	1.6	38
6	2	125	20	40	31	3.8	0.17	1.2	36
6	2	150	20	40	32	4.2	0.17	0.8	34
6	2	175	20	40	33	4.5	0.18	0.6	32

LV A	HV A	Ton μs	Toff μs	GAP V V	VDI	ROUGHNESS μmRa	TWO GAP 2xGAP(mm)	WEAR RATIO %	SPEED mm3/min
8	2	20	5	40	29	2.8	0.13	8.7	36
8	2	40	5	40	30	3.1	0.14	6.4	42
8	2	80	50	40	31	3.4	0.16	3.2	46
8	2	100	10	40	32	3.8	0.17	1.9	52
8	2	125	10	40	32	4.15	0.18	1.4	50
8	2	150	20	40	33	4.5	0.18	1	47
8	2	175	20	40	34	5.2	0.19	0.7	44
8	2	200	20	40	35	5.8	0.21	0.4	40

LV A	HV A	Ton μs	Toff μs	GAP V V	VDI	ROUGHNESS μmRa	TWO GAP 2xGAP(mm)	WEAR RATIO %	SPEED mm3/min
10	2	40	5	40	31	3.2	0.14	7.6	52
10	2	80	5	40	32	3.9	0.16	4.6	57
10	2	100	5	40	32	4.2	0.18	2.4	69
10	2	125	10	40	33	4.5	0.19	2.2	79
10	2	150	10	40	34	5.2	0.20	1.7	65
10	2	175	20	40	35	5.4	0.21	1.5	53
10	2	200	20	40	36	6.3	0.21	0.8	50
10	2	250	20	40	37	6.8	0.22	0.4	48

LV A	HV A	Ton μs	Toff μs	GAP V V	VDI	ROUGHNESS μmRa	TWO GAP 2xGAP(mm)	WEAR RATIO %	SPEED mm3/min
12	2	40	10	40	32	3.4	0.16	8.1	74
12	2	80	10	40	32	4.1	0.17	5.2	81
12	2	100	10	40	33	4.5	0.19	3.6	87
12	2	125	20	40	34	5.0	0.20	3.2	92
12	2	150	20	4	35	5.4	0.21	3	86
12	2	175	20	40	36	6.3	0.23	2.4	81
12	2	200	20	40	36	7.1	0.23	1	78
12	2	250	20	40	37	7.3	0.24	0.8	72

LV A	HV A	Ton μs	Toff μs	GAP V V	VDI	ROUGHNESS μmRa	TWO GAP 2xGAP(mm)	WEAR RATIO %	SPEED mm3/min
15	2	50	10	40	32	3.9	0.17	8.6	81
15	2	100	10	40	33	4.5	0.19	4.1	96
15	2	125	20	40	35	5.2	0.21	3.4	112
15	2	150	20	40	36	6.3	0.22	3.1	105
15	2	175	20	40	38	7.1	0.23	2.6	101
15	2	200	20	40	37	7.4	0.24	1.2	98
15	2	250	20	40	38	7.8	0.25	0.8	95
15	2	300	30	40	38	8.2	0.26	0.5	91

LV A	HV A	Ton μs	Toff μs	GAP V V	VDI	ROUGHNESS μmRa	TWO GAP 2xGAP(mm)	WEAR RATIO %	SPEED mm3/min
20	2	20	5	35	32	3.9	0.21	9.4	132
20	2	50	10	35	34	5.1	0.23	9.0	139
20	2	100	10	35	36	6.3	0.24	5.2	146
20	2	150	20	35	37	7.2	0.27	4.1	158
20	2	200	20	35	38	8.1	0.29	1.8	155
20	2	250	20	35	39	9.0	0.30	1.2	151
20	2	300	30	35	40	10.1	0.32	0.8	144
20	2	350	30	35	41	11.4	0.34	0.4	142

LV A	HV A	Ton μs	Toff μs	GAP V V	VDI	ROUGHNESS μmRa	TWO GAP 2xGAP(mm)	WEAR RATIO %	SPEED mm3/min
25	2	50	5	4	34	5.2	0.24	9.2	161
25	2	100	10	40	36	6.3	0.26	5.6	172
25	2	150	10	40	37	7.3	0.28	4.1	184
25	2	200	20	40	38	8.5	0.31	2.1	181
25	2	250	25	40	39	9.0	0.33	1.4	177
25	2	300	30	4	40	10.7	0.34	1.0	171
25	2	350	30	40	41	11.0	0.35	0.7	165
25	2	400	30	40	42	12.5	0.36	0.3	161

LV A	HV A	Ton μs	Toff μs	GAP V V	VDI	ROUGHNESS μmRa	TWO GAP 2xGAP(mm)	WEAR RATIO %	SPEED mm3/min
30	2	100	10	40	38	7.0	0.27	6.4	196
30	2	150	10	40	38	7.5	0.30	5.2	214
30	2	200	20	40	39	8.6	0.32	2.3	222
30	2	250	20	40	39	9.9	0.35	1.6	213
30	2	300	30	40	40	11	0.36	1.2	210
30	2	350	30	40	40	11.5	0.37	0.9	206
30	2	400	40	40	41	12	0.38	0.6	201
30	2	450	40	40	41	11.2	0.40	0.4	195

LV A	HV A	Ton μs	Toff μs	GAP V V	VDI	ROUGHNESS μmRa	TWO GAP 2xGAP(mm)	WEAR RATIO %	SPEED mm3/min
35	2	100	10	40	39	8	0.28	6.7	232
35	2	200	20	40	40	8.2	0.31	3.2	264
35	2	250	20	40	40	8.9	0.33	1.8	287
35	2	300	20	40	41	10.3	0.36	1.4	272
35	2	350	30	40	41	11.6	0.38	1.0	269
35	2	400	30	40	42	12.1	0.40	0.8	263
35	2	450	40	40	42	12.4	0.41	0.6	258
35	2	500	40	40	43	13	0.43	0.3	254

LV A	HV A	Ton μs	Toff μs	GAP V V	VDI	ROUGHNESS μmRa	TWO GAP 2xGAP(mm)	WEAR RATIO %	SPEED mm3/min
40	2	200	20	40	40	9	0.32	4.6	291
40	2	250	20	40	41	9.6	0.34	2.6	314
40	2	300	30	40	41	10.7	0.37	1.8	326
40	2	3.5	30	40	42	11.9	0.39	1.2	317
40	2	400	30	40	42	12.8	0.41	1.0	311
40	2	450	30	40	43	13.1	0.42	0.8	3.5
40	2	500	40	40	43	14	0.44	0.5	297
40	2	550	40	40	44	15.1	0.47	0.2	292

LV A	HV A	Ton μs	Toff μs	GAP V V	VDI	ROUGHNESS μmRa	TWO GAP 2xGAP(mm)	WEAR RATIO %	SPEED mm3/min
45	2	200	17	40	41	10	0.33	4.8	316
45	2	300	18	40	41	10.6	0.36	2.3	347
45	2	350	19	40	42	11	0.38	1.7	345
45	2	400	20	40	42	12.1	0.40	1.0	341
45	2	450	21	40	43	13.6	0.42	0.9	336
45	2	500	22	40	43	14.3	0.43	0.7	332
45	2	550	22	40	44	15.6	0.46	0.5	326
45	2	600	23	40	44	16.4	0.49	0.2	321

LV A	HV A	Ton μs	Toff μs	GAP V V	VDI	ROUGHNESS μmRa	TWO GAP 2xGAP(mm)	WEAR RATIO %	SPEED mm3/min
50	2	300	17	40	42	11	0.37	3	388
50	2	350	22	40	43	11.8	0.39	1.3	391
50	2	400	19	40	43	12.9	0.41	0.9	386
50	2	450	19	40	44	14	0.43	0.7	383
50	2	500	20	40	44	14.9	0.45	0.5	379
50	2	550	21	40	45	16.9	0.47	0.4	372
50	2	600	21	40	45	18	0.51	0.2	364
50	2	650	22	40	45	>18	0.54	0.2	361

LV A	HV A	Ton μs	Toff μs	GAP V V	VDI	ROUGHNESS μmRa	TWO GAP 2xGAP(mm)	WEAR RATIO %	SPEED mm3/min
55	2	300	30	40	42	12.1	0.38	3.1	407
55	2	400	40	40	43	12.9	0.40	1.6	424
55	2	450	40	40	43	13.4	0.42	0.9	428
55	2	500	40	40	44	15.1	0.44	0.7	418
55	2	550	40	4	44	15.9	0.47	0.5	407
55	2	600	40	4	45	17	0.49	0.3	402
55	2	650	40	40	45	18	0.52	0.2	397
55	2	700	40	40	45	>18	0.55	0.2	392

LV A	HV A	Ton μs	Toff μs	GAP V V	VDI	ROUGHNESS μmRa	TWO GAP 2xGAP(mm)	WEAR RATIO %	SPEED mm3/min
60	2	400	40	40	43	14.1	0.41	2.7	446
60	2	450	40	40	44	15.3	0.43	1.8	478
60	2	500	40	40	44	16.4	0.45	1.1	481
60	2	550	40	40	45	17.8	0.48	0.9	472
60	2	600	40	40	45	18	0.50	0.7	467
60	2	650	40	40	>45	>18	0.53	0.6	461
60	2	700	40	40	>45	>18	0.56	0.3	453
60	2	800	40	40	>45	>18	0.59	0.2	450

Graphite → Steel

LV A	HV A	Ton μs	Toff μs	GAP V V	VDI	ROUGHNESS μmRa	TWO GAP 2xGAP(mm)	WEAR RATIO %	SPEED mm3/min
1	1	10	10	50	24	1.6	0.04	6.4	4.2
1	1	20	10	50	25	1.8	0.06	5.6	5.1
1	1	30	10	50	24	1.9	0.08	5.1	5.4
1	1	40	10	50	26	2.0	0.10	4.2	6.8
1	1	50	20	50	26	2.1	0.10	3.6	6.4
1	1	60	20	50	27	2.24	0.11	2.1	5.2
1	1	7	20	5	29	2.8	0.13	1.6	4.7
1	1	80	20	50	29	2.8	0.13	1.3	4.4

LV A	HV A	Ton μs	Toff μs	GAP V V	VDI	ROUGHNESS μmRa	TWO GAP 2xGAP(mm)	WEAR RATIO %	SPEED mm3/min
2	1	10	10	50	23	1.3	0.07	6.8	4.3
2	1	20	10	50	24	1.6	0.09	6.2	5.4
2	1	30	10	50	29	1.7	0.10	5.6	6.4
2	1	40	10	50	26	1.8	0.10	4.5	7.3
2	1	50	20	50	31	1.9	0.11	3.8	8.2
2	1	60	20	50	33	2.0	0.11	2.4	9.6
2	1	70	20	50	34	2.1	0.12	1.8	10.4
2	1	80	20	50	28	2.3	0.12	1.4	12

LV A	HV A	Ton μs	Toff μs	GAP V V	VDI	ROUGHNESS μmRa	TWO GAP 2xGAP(mm)	WEAR RATIO %	SPEED mm3/min
3	1	10	10	50	24	1.60	0.08	7.6	4.6
3	1	20	10	50	25	1.82	0.09	5.6	7.1
3	1	30	10	50	29	2.06	0.10	5.2	12
3	1	40	10	50	27	2.24	0.11	4	16
3	1	50	20	50	31	2.38	0.12	2.8	18
3	1	60	20	50	33	2.61	0.12	2.1	20
3	1	80	20	50	29	2.86	0.13	1.6	23
3	1	100	20	50	30	3.15	0.14	1.2	27

Graphite → Steel

LV A	HV A	Ton μs	Toff μs	GAP V V	VDI	ROUGHNESS μmRa	TWO GAP 2xGAP(mm)	WEAR RATIO %	SPEED mm3/min
4	1	10	10	40	24	1.60	0.08	9.4	6
4	1	20	10	40	27	2.24	0.10	6.13	10
4	1	30	10	40	29	2.6	0.10	5.7	14
4	1	40	10	40	29	2.84	0.11	4.8	19
4	1	60	20	40	30	3.04	0.12	3.6	24
4	1	80	20	40	30	3.15	0.13	2.0	29
4	1	100	20	40	31	3.42	0.14	1.5	31
4	1	125	20	40	32	3.76	0.15	0.9	27

LV A	HV A	Ton μs	Toff μs	GAP V V	VDI	ROUGHNESS μmRa	TWO GAP 2xGAP(mm)	WEAR RATIO %	SPEED mm3/min
5	2	20	20	40	28	2.8	0.11	6.4	14
5	2	30	20	40	28	3.0	0.12	5.7	17
5	2	40	20	40	30	3.15	0.12	4.6	23
5	2	60	20	40	30	3.2	0.13	3.4	26
5	2	80	20	40	31	3.4	0.14	2.1	33
5	2	100	20	40	31	3.7	0.15	1.6	34
5	2	125	20	40	32	3.9	0.16	1.0	31
5	2	150	20	40	33	4.4	0.17	0.6	29

LV A	HV A	Ton μs	Toff μs	GAP V V	VDI	ROUGHNESS μmRa	TWO GAP 2xGAP(mm)	WEAR RATIO %	SPEED mm3/min
6	2	20	20	40	28	2.9	0.12	6.8	18
6	2	30	20	40	28	3.1	0.12	6.7	23
6	2	40	20	40	30	3.2	0.13	4.1	29
6	2	60	20	40	30	3.3	0.14	2.4	31
6	2	80	20	40	31	3.7	0.15	1.6	35
6	2	100	20	40	31	3.8	0.16	1.2	37
6	2	125	20	40	32	4.1	0.17	0.8	34
6	2	150	20	40	33	4.5	0.18	0.6	32

LV A	HV A	Ton μs	Toff μs	GAP V V	VDI	ROUGHNESS μmRa	TWO GAP 2xGAP(mm)	WEAR RATIO %	SPEED mm3/min
8	2	20	20	40	29	2.8	0.12	7.8	42
8	2	30	20	40	31	3.0	0.13	7.2	45
8	2	40	20	40	30	3.1	0.14	4.4	51
8	2	60	20	40	33	3.2	0.15	3.2	54
8	2	80	20	40	31	3.4	0.16	1.7	59
8	2	100	20	40	32	3.8	0.17	1.3	67
8	2	125	20	40	32	4.5	0.18	0.9	63
8	2	150	20	40	33	4.5	0.19	0.6	58

LV A	HV A	Ton μs	Toff μs	GAP V V	VDI	ROUGHNESS μmRa	TWO GAP 2xGAP(mm)	WEAR RATIO %	SPEED mm3/min
10	2	20	20	40	30	3.1	0.13	8.2	46
10	2	40	20	40	31	3.2	0.14	4.6	54
10	2	80	20	40	32	3.9	0.16	1.9	68
10	2	100	20	40	32	4.2	0.18	1.4	74
10	2	125	20	40	33	4.5	0.19	1	88
10	2	150	20	40	34	5.2	0.20	0.6	78
10	2	175	20	40	35	5.4	0.21	0.4	64
10	2	200	20	40	36	6.3	0.21	0.4	62

LV A	HV A	Ton μs	Toff μs	GAP V V	VDI	ROUGHNESS μmRa	TWO GAP 2xGAP(mm)	WEAR RATIO %	SPEED mm3/min
12	2	20	20	40	33	3.3	0.14	8.9	76
12	2	40	20	40	32	3.4	0.16	4.8	84
12	2	80	20	40	32	4.1	0.17	2.1	96
12	2	100	20	40	33	4.5	0.19	1.6	104
12	2	125	20	40	34	5.0	0.20	1.2	112
12	2	150	20	40	35	5.4	0.21	0.6	108
12	2	175	20	40	36	6.3	0.23	0.6	104
12	2	200	20	40	36	7.1	0.23	0.4	98

LV A	HV A	Ton μs	Toff μs	GAP V V	VDI	ROUGHNESS μmRa	TWO GAP 2xGAP(mm)	WEAR RATIO %	SPEED mm3/min
15	2	40	20	40	35	3.6	0.16	5.2	97
15	2	80	20	40	37	4.2	0.18	2.3	118
15	2	100	20	40	33	4.5	0.19	1.7	126
15	2	125	20	40	35	5.2	0.21	1.3	134
15	2	150	20	40	36	6.3	0.22	0.8	132
15	2	175	20	40	38	7.1	0.23	0.6	128
15	2	200	20	40	37	7.4	0.24	0.6	124
15	2	250	20	40	38	7.8	0.25	0.4	119

LV A	HV A	Ton μs	Toff μs	GAP V V	VDI	ROUGHNESS μmRa	TWO GAP 2xGAP(mm)	WEAR RATIO %	SPEED mm3/min
20	2	50	20	40	34	5.1	0.23	5.3	164
20	2	80	20	40	37	5.6	0.24	3.2	187
20	2	100	20	40	36	6.3	0.25	2.1	192
20	2	125	20	40	37	7.2	0.26	1.6	206
20	2	150	20	40	37	7.4	0.27	1.1	194
20	2	175	20	40	39	7.6	0.28	0.8	192
20	2	200	20	40	38	8.1	0.29	0.4	188
20	2	250	20	40	39	9.0	0.30	0.4	183

LV A	HV A	Ton μs	Toff μs	GAP V V	VDI	ROUGHNESS μmRa	TWO GAP 2xGAP(mm)	WEAR RATIO %	SPEED mm3/min
25	2	80	20	40	39	6.1	0.25	3.6	227
25	2	100	20	40	36	6.3	0.26	2.3	236
25	2	125	20	40	39	6.8	0.27	1.7	248
25	2	150	20	40	37	7.3	0.28	1.4	240
25	2	175	20	40	41	7.6	0.31	1.1	231
25	2	200	20	40	38	8.5	0.32	0.6	221
25	2	250	20	40	39	9.0	0.33	0.4	214
25	2	300	30	40	40	10.1	0.34	0.4	210

Graphite → Steel

LV A	HV A	Ton μs	Toff μs	GAP V V	VDI	ROUGHNESS μmRa	TWO GAP 2xGAP(mm)	WEAR RATIO %	SPEED mm3/min
30	2	100	20	40	38	6.8	0.28	2.6	251
30	2	125	20	40	37	7.0	0.28	1.8	2680
30	2	150	20	40	38	7.5	0.30	1.6	272
30	2	175	20	40	39	8.4	0.32	1.3	266
30	2	200	20	40	39	8.6	0.32	0.7	254
30	2	250	20	40	39	9.9	0.35	0.4	251
30	2	300	30	40	40	11	0.36	0.4	247
30	2	350	30	40	40	11.5	0.37	0.4	243

LV A	HV A	Ton μs	Toff μs	GAP V V	VDI	ROUGHNESS μmRa	TWO GAP 2xGAP(mm)	WEAR RATIO %	SPEED mm3/min
35	2	125	20	40	37	7.0	0.28	2.4	298
35	2	150	20	40	38	7.6	0.30	1.8	312
35	2	175	20	40	39	8.0	0.31	1.4	326
35	2	200	20	40	40	8.2	0.32	0.8	311
35	2	250	20	40	40	8.9	0.33	0.4	308
35	2	300	30	40	41	10.3	0.36	0.4	303
35	2	350	30	40	41	11.6	0.38	0.4	296
35	2	400	40	40	42	12.1	0.40	0.4	291

LV A	HV A	Ton μs	Toff μs	GAP V V	VDI	ROUGHNESS μmRa	TWO GAP 2xGAP(mm)	WEAR RATIO %	SPEED mm3/min
40	2	150	20	40	38	8.0	0.30	2.4	332
40	2	175	20	40	39	9.0	0.32	1.6	354
40	2	200	20	40	40	9	0.32	0.8	368
40	2	250	20	40	41	9.6	0.34	0.6	374
40	2	300	30	40	41	10.7	0.37	0.6	364
40	2	350	30	40	42	11.9	0.39	0.4	358
40	2	400	40	40	42	12.8	0.41	0.4	351
40	2	450	40	40	43	13.1	0.42	0.4	348

LV A	HV A	Ton μs	Toff μs	GAP V V	VDI	ROUGHNESS μmRa	TWO GAP 2xGAP(mm)	WEAR RATIO %	SPEED mm3/min
45	2	175	20	40	39	9.0	0.32	1.8	386
45	2	200	20	40	41	10	0.33	1.2	392
45	2	250	20	40	41	10	0.33	0.6	398
45	2	300	30	40	41	10.6	0.36	0.6	392
45	2	350	30	40	42	11	0.38	0.4	386
45	2	400	40	40	42	12.1	0.40	0.4	381
45	2	450	40	40	43	13.6	0.42	0.4	371
45	2	500	50	40	43	14.3	0.43	0.4	364

LV A	HV A	Ton μs	Toff μs	GAP V V	VDI	ROUGHNESS μmRa	TWO GAP 2xGAP(mm)	WEAR RATIO %	SPEED mm3/min
50	2	200	20	40	44	10	0.34	1.4	412
50	2	250	20	40	41	11.2	0.36	1	426
50	2	300	30	40	42	11	0.37	0.8	413
50	2	350	30	40	43	11.8	0.39	0.6	406
50	2	400	40	40	43	12.9	0.41	0.4	393
50	2	450	40	40	44	14	0.43	0.4	383
50	2	500	50	40	44	14.9	0.45	0.4	387
50	2	550	50	40	45	16.9	0.47	0.4	381

LV A	HV A	Ton μs	Toff μs	GAP V V	VDI	ROUGHNESS μmRa	TWO GAP 2xGAP(mm)	WEAR RATIO %	SPEED mm3/min
55	2	250	20	40	41	11.2	0.36	1.3	434
55	2	300	30	40	42	12.1	0.38	0.9	438
55	2	350	30	40	42	12.1	0.38	0.7	432
55	2	400	40	40	43	12.9	0.40	0.4	426
55	2	450	40	40	43	13.4	0.42	0.4	418
55	2	500	50	40	44	15.1	0.44	0.4	409
55	2	550	50	40	44	15.9	0.47	0.4	402
55	2	600	60	40	45	17	0.49	0.4	398

Graphite → Steel

LV A	HV A	Ton μs	Toff μs	GAP V V	VDI	ROUGHNESS μmRa	TWO GAP 2xGAP(mm)	WEAR RATIO %	SPEED mm3/min
60	2	250	20	40	41	11.2	0.36	1.4	442
60	2	300	30	40	42	12.6	0.39	1.2	464
60	2	350	30	40	43	14	0.42	0.8	448
60	2	400	40	40	43	14.1	0.41	0.4	442
60	2	450	40	40	44	15.3	0.43	0.4	437
60	2	500	50	40	44	16.4	0.45	0.4	431
60	2	550	50	40	45	17.8	0.48	0.4	428
60	2	600	60	40	45	18	0.50	0.4	420

IV

PC-Based EDM System

Trouble shooting

1. Modules:

Name	Elements	Contents	Function	Fault Response
PC Module	PC Main Board	IPC	ALL-IN-ONE IPC With ECOWIN EDM firmware	No display. Display not normal. System hanging.
	Input/Output Card	PIC630*	I/O access between PC & Sparking Module. System monitoring.	System initiation fail. Power ON fail. System hanging. Supervision fail.
	Motion Control Card	PMC620*	Position Data display and counting. Servo motion control. System monitoring.	System initiation fail. Power ON fail. System hanging. No position counting or counting not normal. Axis Run-Away.
	PC Power Supply	Above 200W	Power supply of IPC	System initiation fail.
Monitor	Colour display unit	14” colour CRT	User-Friendly MMI	No display or not normal
Keyboard	Entry keyboard	KB9610*	For entry key-in.	System initiation fail. No or wrong key-in.
Sparking Module	I/O Card (with PC)	PPC9540*	I/O with PC. POWER ON Control. Security supervision. Sparking servo output. Equivalent Sparking signal & anti-arcing signal processing.	Power ON fail. Over-Travel not normal. Supervision not normal. Sparking servo control not normal: Gap-control not stable. Sparking On, but Electrode up, not down. Poor Sparking stability.
	Spark-decoding. Oscillating signal for sparking.	PDC9348*	Sparking Codes output. Sparking oscillator. Equivalent sparking control. Anti-arcing control.	Easy arcing. Always arcing. Wrong spark decodes. Wrong sparking current. Sparking On, but electrode up, not down.
	Sparking Current Output	PSP931*	HV output: 0 – 7 A LV output: 0 – 64 A	No HV output. LV output not normal. Always arcing.
	Signals Transfer	PBS938*	Mother board of Sparking Module. Signals transferring. Power for driver: H +/-12 : for HV L +/-12 : for LV S +/-12 : for Servo OSVCC: for OSCillator.	No sparking current. Sparking On, but electrode up, not down or no moving.
Drive Unit	Servo driver	MDR-680	DC Servo Motor Driver DCV = 36 – 150	Servo Motor no moving. Motor burned out.

Name	Elements	Contents	Function	Fault Response
Resistor Module	Resistors for each Limiting sparking current	60 A、120 A、180 A、250A 300 A、、、	RPR – 64 Power Resistor Modules. (120, 180, 250, 320 …A.)	Resistor broken, sparking current lower than command.
Power Supply Module	Sparking Power	L120-75A(150A) H280-5A	For Low Voltage current For High Voltage current	No LV or HV sparking current output.
	Servo Power	MVCC-10A (80V,140V)	For Servo driver power	No servo motion.
Remote Control box	Portable line control box	KEY	Manual Jog with potential. Sparking Start/Stop.	No key function.
M/C interface I/O Card	Interface between M/C & Cabinet	SCL963*	Security I/O. Linear scale signals driver.	Supervision not normal. Position counting fault. Axis run-away.

2. PC basic set-up

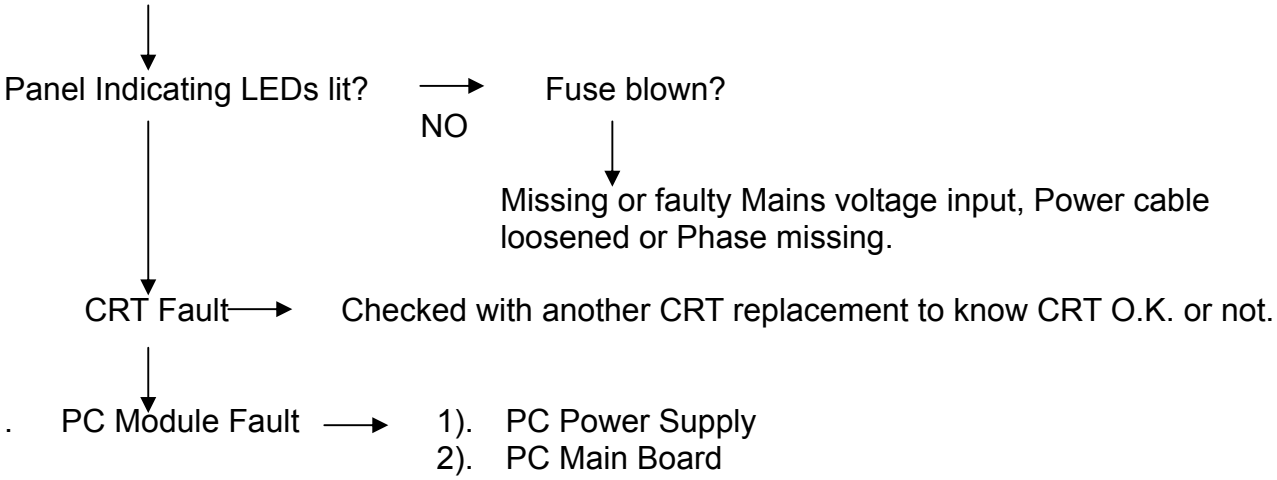
1). CMOS BIOS set up:
Mains Switch ON, press 『↓』 key, entering CMOS BIOS set-up:
A. Disable A 、B、C、D Diskette.
B. The others same as normal PC set-up.

2). Set Up of Linear Scales for different specification:
Mains switch ON, before system initiation, press ESC key,
Monitor displays：
A >
For PNC with Scale 0.001mm type， key in X 1 then ENT key.
For PNC with Scale 0.005mm type， key in X 5 then ENT key.
For ZNC with Scale 0.001mm type， key in Z 1 then ENT key.
For ZNC with Scale 0.005mm type， key in Z 5 then ENT key.

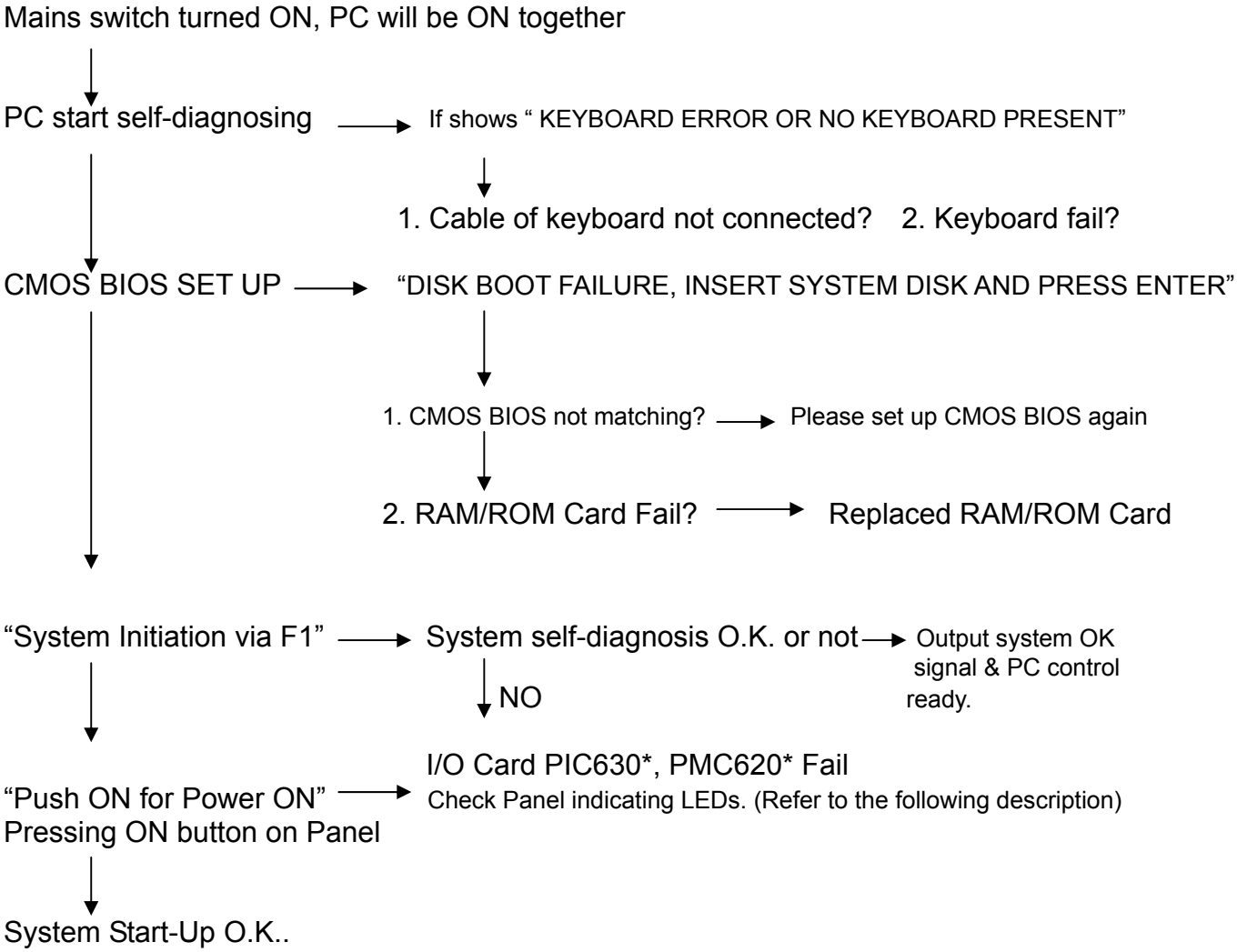
Mains Switch OFF and ON again, it will work.

3. Fault Finding:

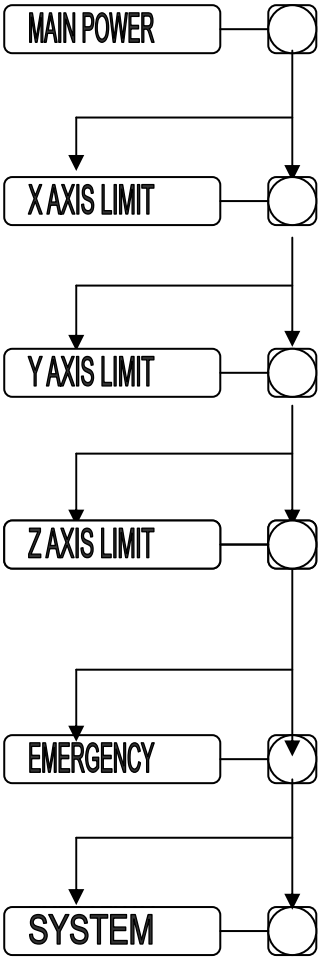
3.1 Mains ON, no Display on CRT



3.2 Power ON sequence:



3.3 System Supervision Indicating LED Description:



ON: Mains switch ON, Mains Power O.K.
OFF: Mains Switch OFF or Mains Power not O.K.
All the other indicating LEDs off.
Check: Fuse, Mains or PPC9540* PCB fail?

ON: X-axis over-travel L.S. not reached.
OFF: X-axis is over-travel, Power ON blocked.
Check: X Limit Switch/wiring, SK7 Connector / Wiring, & PGM/CN10, or PPC9540* PCB fail?

ON: Y-axis over-travel L.S. not reached.
OFF: Y-axis is over-travel, Power ON blocked.
Check: Y Limit Switch/wiring, SK8 Connector / Wiring, & PGM/CN11, or PPC9540* PCB fail?

ON: Z-axis over-travel L.S. not reached.
OFF: Z-axis is over-travel, Power ON blocked.
Check: Z Limit Switch/wiring, SK9 Connector / Wiring, & PGM/CN12, or PPC9540* PCB fail?

ON: Emergency Stop button not pressed down.
OFF: Emergency Stop button pressed down.
Check: Buttons/wiring on Panel & Remote Box?

ON: PC System ready for Power ON (Sparking & Servo)
OFF: PC System not ready yet, Power ON blocked.
Check: 1. PCBs of PC Modules put in correct location?
2. PIC、PMC PCB fail?
3. PC Modules fail?

Caution:

Power ON blocked as any one of the above green System indicating LEDs not lit up.

3.4 Position Data not Counting or counting not normal when axes moving:

Possible causes:

1. Power Supply of Linear Scale.
2. Cables of Linear Scales (Scales→ SCL/SN1,2,3) (SCL/CN4,5,6 →SK1,2,3)
3. Intermediate Signals Cable of Scales (PGM/CN4 → PMC/CN1)
4. Driver PCB of Scales Signals PGM942.
5. PCB SCL963* or PMC 620*.
6. Linear Scale.

Path of counting signals of Linear Scales:
Reader head→ Scale cable → Scale connector → SCL/CN1(2, 3) → SCL/CN4(5, 6) → SK 1 (2, 3) → (PGM/CN1, 2, 3) → PGM/CN4 →PMC/CN1

Pin assignment of linear scales：SCL/CN1(2, 3) for X(Y, Z) axis

SCL/CN1(2,3) pin 1 = DC5V
SCL/CN1(2,3) pin 2 = A phase
SCL/CN1(2,3) pin 3 = B phase
SCL/CN1(2,3) pin 4 = Ref. signal
SCL/CN1(2,3) pin 5 = 0V
SCL/CN1(2,3) pin 6 = GND

3.5 Counting repeatability:

1) Testing method:
   1. Check with Dial Gauge, move to desired point: Reset “0” on both Dial-Gauge & PC Position DATA.
   2. Move axis away, then back to zero point: Compare the reading between Dial-Gauge & Position DATA.

2) Reason of error:
   1. Linear scale signal connected improperly → Please check every node: scale head → scale cord → scale socket → SCL/CN1(2,3) → SCL/CN4(5,6) → SK1(2,3) → (PGM/CN1,2,3)
   (***Especially check for contact problem***)
   2. Linear scale fail.
   3. PMC620* PCB fail.

3.6 Counting accuracy and compensation:

Testing method:
1. Checked with fine Dial Gauge & Block Gauge.
2. Compare the difference of 100mm travel with a few times of measuring, to get its average.
3. Enter the average data into MP120 …MP125.
4. Check again until satisfied.

3.7 X (Y, Z) Run-Away when Power ON:

Possible causes:
1. No position feedback from linear scale.
2. No Tacho feedback (TG).
3. Servo Drive (MDR- 680) fails.
4. PC Module: Counting direction incorrect, I/O PCB (PMC –620*) fail.

Caution: When Power ON and axis runs away, Press down the Emergency-Stop button as soon as possible. The power of servo system will be cut off.
Manually traverse the M/C table to the safe area for further remedies.

Remedies:

X (Y,Z) Axis Run-Away?

↓

Is the Position Counting correct?

↓

Mains switch ON → "F1" pressed → "Δ" pressed .(instead of "ON").
Enter Main Menu of system, but DO NOT Power ON.
Turn the pulley of each axis by hand to check its position counting O.K. or not.
No counting or counting is not normal, please refer to the last step of fault-finding
to diagnose the problem.

No Tacho (TG) feedback due to wiring?

1. Power OFF, remove PMC/CN2 connector, (for motion control)
   Power ON again, if still run-away, fault could be:
   Tacho, Cable of Tacho, or Servo Drive MDR – 680 fail.
2. PC Module fails.
3. Path of Tacho (TG) of Servo Motor:
   TG of Motor (SK7(8,9) (PSE/TB1 (XMDR/CN1 –2,7

3.8 Easy arcing or always arcing：

After Power "ON" (for Sparking and Servo), Sparking-On not initiated yet,
About 120V showed on V-Meter. (It's not normal.):
PCB PSP931* of Sparking Module is defective.
After Power "ON" (for Sparking and Servo), Sparking-On not initiated yet,
About 12V showed on V-Meter. (It's O.K.):
Possible causes:

1） Wrong sparking codes setting: Too big of Ton, or too small of Toff or GAP.
2） PCB PDC9348* of Sparking Module is defective.

3.9 Executing “Sparking-On”, Electrode moves up instead of down for machining:

Sparking-On initiated, no touch yet between electrode and workpiece,
No voltage exists on Volt-Meter or smaller than 120V, Electrode moves up instead of down for machining：

No Volts, or not high enough V-meter after Sparking On

↓

Wrong Sparking Codes → 1.LV = 0 ，HV= 0 , so no voltage out, Electrode up.
2. SERVO too low, UPD too big, WT too small.

↓

Power fault → 1. Volt of (LV) = DC 120V ，Volt of（HV）= DC 280V
2. After POWER ON,
Measuring Electrode “ + ”
with 0V at L0 （PSP931* TB3）, it should be 120V
with 0V at H0 （PSP931* TB1/7）, it should be 280V
3. If not, check Fuse, Mains voltage and phase, could be voltage too low or phase missing.
4. No OSC signal: PDC9348* PCB of Sparking Module fail.

↓

No Servo signal output → V- meter should higher than 120V, SVO data on CRT greater than 125 after Sparking-On, and before real sparking happens.
If SVO data on CRT < 125, then it could be:
1. Sparking Wires be short.
2. Feedback of Sparking Voltage missing.
3. PPC9540* PCB of Sparking Module fault.

↓

Wrong Servo output → Volt display on V- meter higher than 120V after Sparking-On

SVO display on CRT > 125, then it could be PMC-620* PCB of PC Module fail.

4. Electrode moves up after Sparking On initiated:

Press RUN to start sparking. No voltage on V-meter, electrode moves up.

4.1 Monitoring problem?
Please turn off monitoring, then run sparking again

If Sparking On O.K, please eliminate the monitored security problem.
Otherwise go to next step.
Preset sparking codes as follows, then try again.

4.2 Please input new codes for testing

PGM:106 DEPTH:-1.000 P_BLK:6 DINECTION:-AXIS:Z

NR	DEPTH	CODE	LV	HV	Ton	Toff	GAP	SPD	UPD	WT	P/N	TIME	CTL
1	-5.000	068	6	2	175	40	2	8	4	8	+	00:00:00	0

*** ***

If Sparking problem solved, please pay attention to your sparking codes editing next time.

Otherwise, check next step.

4.3 Power supply voltage problem?

Please check local power supply voltage specification, wiring and input are all correct?

Please check voltage between each line.

L1、L2、L3 ⟶ L11、L22、L23 ⟶ L31、L32、L33 ⟶ L41、L42、L43

All should correspond to local voltage.

4.4 Please check all voltage on all transformers I/O, are they all O.K.!?

PTF1 = 85*3 、 0 ⇔ 200、 0 ⇔ 55

PTF2 = 0 ⇔ 110 、 18 ⇔ 0⇔ 18

TF3 = 14 ⇔ 0 ⇔ 14*3

If Yes, it's correct.

If No, could be fuse blown or wiring missing.

4.5 PCB check

Check all PCB's are installed correctly, with no contact problems.

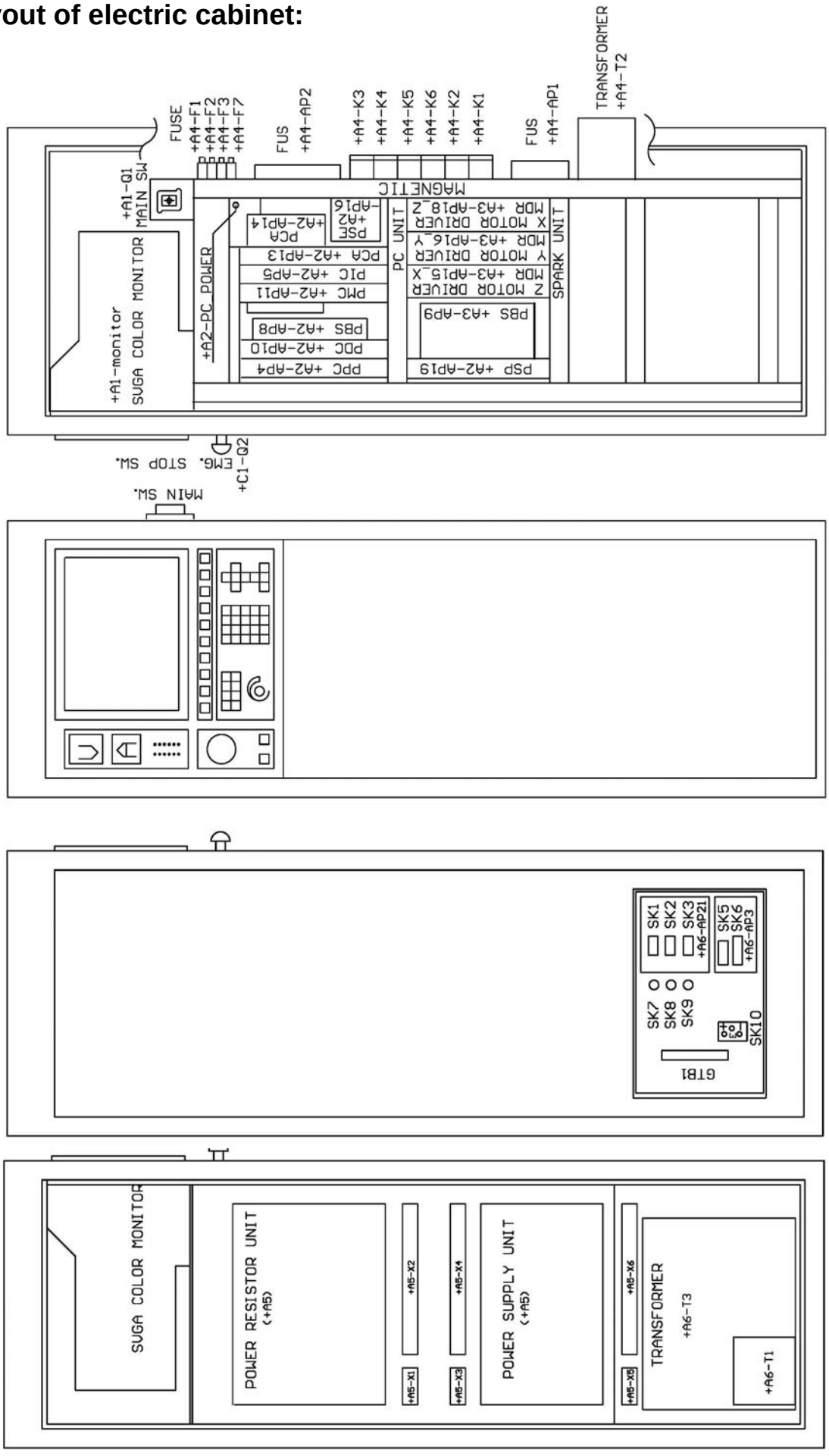
Check all wiring, plug connectors, with no contact problems.

**If necessary, remove the PCB's, connectors, wires, plugs, then fit them again.

Make sure PCB LED display light up O.K. as normal.

4.6 Good Luck!!!

5. Layout of electric cabinet:



6. Maintenance

Period	Inspection item	Method	Space
Daily	Oil filled(axis movement, ball screw…etc)	Manual pull rod/auto	
	Quantity of dielectric	Visual	
	Door tighten check of work tank	Visual	
	Dielectric level setting check	Function check	
	Fire detect function check	Function check	
	Extinguisher pressure check	Visual	
Weekly	Lubricant quantity and waste oil check	Waste oil retrieve	
	Dielectric filter check	Pressure meter	
Monthly	Transfer belt check	Visual	
	Air filter cotton of electric cabinet clean	Visual	
Six Monthly	Extinguisher contents quantity check	Scales	
	Screw thread of electrode clean and lubricate	Clean and lubricate	
	Transfer belt check	Replacement	
	Door tighten check of oil tank	Replacement	
	X/y screw shaft clean and lubricate	Clean and lubricate	
	X/y/z movement confirm	Function check	
	Cooler filter clean	Function check	
Annual	Extinguish device precision check	Extinguish device replacement	
	Motor carbon dioxide inspection (executed by supplier or local authorized agent)	Disassemble check	
	Mechanical precision measuring and revising	Measuring and revising	
	Knot distance inaccuracy measuring	Measuring and revising	

***We recommend use SAE20 lubricant or equivalent oil at lubricant system.**

****The lubricator of lubricant system:**

a. **Use grease No. 0.00 only.**
b. **Each delivery of oil is amounted to 2c.c.**
c. **Seal the grease tank and keep it clean.**
d. **Refill from gun only never refill from the top of reservoir.**
e. **The tank capacity is 650c.c.**
f. **Average flow pressure is 100kgf/cm**

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